



Environment

Submitted to:
Arch Chemicals, Inc.
Charleston, Tennessee

Submitted by:
AECOM
Belmont, NH
60135922
June 21, 2010

Ecological Risk Assessment 350 Knotter Drive Cheshire, Connecticut Final



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1.0 Introduction

This Screening-level Ecological Risk Assessment (SLERA) was conducted by AECOM Environment (AECOM; formerly ENSR) on behalf of Arch Chemicals, Inc. (Arch) to evaluate whether exposure to environmental media located at the facility located at 350 Knotter Drive in Cheshire, Connecticut (the Site; Figure 1) poses a potential for significant risk to the environment due to Site-related constituents. The purpose of this SLERA is to provide a conservative evaluation of potential ecological risks posed by Site-related constituents as part of the site-wide Resource Conservation and Recovery Act (RCRA) Closure process.

The specific objectives of the SLERA are to:

- Identify potential ecological receptors and habitats and potential migration pathways;
- Identify and evaluate potential ecological risks based on conservative screening of existing soil and groundwater data; and
- Identify constituents of potential concern (COPCs) and areas of the Site that might require further evaluation.

The SERA presented in this document consists of an evaluation of the environmental setting, Site history, receptors, and Site-specific exposure pathways to species/habitats of concern, and a screening-level evaluation of the exposure and risks. The SLERA has been conducted in accordance with the following Site-specific documents:

- Ecological Risk Assessment Work Plan dated April 2007;
- Responses to Connecticut Department of Environmental Protection (CTDEP) comments on the Work Plan were provided on January 21, 2008;
- Ecological Risk Assessment Work Plan Addendum dated July 2008;
- Correspondence provided by on February 27, 2009 which included responses to CTDEP comments on the Addendum, a Quality Assurance Project Plan (QAPP), the results of the most recent Stormwater Monitoring Report, a completed Ecological Receptor Exposure Pathway Scoping Checklist, and completed Current Human Exposures Under Control and Migration of Contaminated Groundwater Under Control Environmental Indicator forms; and
- A memorandum entitled "Inspection of two detention basins and former drainage swale at Arch Chemical facility" on March 20, 2009.

On May 8, 2009 CTDEP provided comments on the latter two sets of deliverables and on June 30, 2009 a conference call between CTDEP, United States Environmental Protection Agency (U.S. EPA), Arch, and AECOM was held to discuss the proposed responses to these comments. Responses to CTDEP's comments were provided on July 7, 2009. On August 4, 2009 CTDEP provided approval of the Work Plan and subsequent responses to comments and related documentation. Soil sampling at the facility was conducted on November 9, 2009 with oversight by CTDEP and U.S. EPA. A draft of the Ecological Risk Assessment was submitted to CTDEP in March 2010 and CTDEP provided comments on the report on May 26, 2010. This version of the Ecological Risk Assessment report has been finalized to

address the comments as discussed in a conference call between CTDEP, U.S. EPA, and AECOM held on June 8, 2010.

1.1 Site History

The facility at 350 Knotter Drive has been used by Arch/Olin since Olin acquired the facility in 1983. The facility was previously occupied by Siemens, a medical equipment manufacturing company, from its construction in 1975 to 1983. Prior to 1975, the Site and surrounding area was under agricultural use.

No information is available regarding the specific activities performed by Siemens at the facility during their occupancy. It is expected that activities typical of medical equipment manufacturing companies were being performed including: metal working, painting, finishing, parts cleaning, and parts assembly. COPCs associated with these activities include volatile and semi-volatile organic compounds (VOCs and SVOCs), metals, and petroleum hydrocarbons.

The facility was originally constructed in 1975 and was originally serviced by a private septic system. This system was located to the east of the facility building. An addition was built onto the southwestern portion of the building during 1980 and 1981 and the facility was connected to the municipal sanitary sewer system in 1981. The facility is currently serviced by public water, sanitary sewer, electric and natural gas utilities.

Arch/Olin has used the facility as a research and development (R&D) laboratory facility throughout their occupation of the Site. R&D work conducted by Arch/Olin concentrated on swimming pool chemicals, surfactants, liquid toners, urethane compounds, and biocide compounds. Project-specific specialty chemicals (e.g., propellants for explosives) have also been the subjects of R&D at the facility.

According to Arch personnel, hydroxyl ammonia nitrate (HAN), a liquid propellant, and hydrazine, a rocket fuel, were used in very small quantities (lab quantities) at the facility. Current Arch staff is unaware of the exact process in which these chemicals were used, but stated that it was only lab scale work. Any waste generated would have been collected for off-site disposal with other hazardous waste generated at the facility. Both HAN and hydrazine were used at the facility from approximately 1984 until 2005. Note that the facility has been connected to the sanitary sewer since 1981; therefore, no discharges of explosives to the environment are expected to have occurred. All chemical wastes in the main building are collected and temporarily stored in the "waste transfer room" located on the southeastern side of the building. This room has secondary containment consisting of a sealed and sloped concrete floor and separate bermed areas for drums of solvent, basic, and acid wastes.

Previous environmental reports for the Site documented the presence of several historical Site features of potential environmental significance that were not related to Arch/Olin site use (see Section 3.0 of the Verification Report (ENSR, 2004a) for a summary of previous Site investigations). These include a "test well" and former treatment pits located within the eastern end of the building as well as a leaching pit and a 1,500-gallon underground storage tank (UST) of unknown use located to the east of the building. These features were never used by Arch/Olin and their function is unknown; however, the 1,500-gallon UST was closed in place by Olin in 1983 after it was emptied and cleaned. The contents of the UST were characterized as an ignitable organic and were consequently disposed of as hazardous waste. The 1,500-gallon UST and the leaching pit were both located in the vicinity of the facility's interim waste storage (IWS) unit, although they are not associated with it in any way.

The facility boilers are fueled by both fuel oil and natural gas. One 20,000-gallon UST containing #2 fuel oil is located east of the site building, near the boiler room. This fuel oil UST was installed in 1993 as a

replacement for a similarly sized tank that was installed in 1975. Previous reports (ENSR, 2004a) indicated no evidence of spills or stains on the ground surface near the UST fill pipe. Additionally, the UST is equipped with an overspill bucket. According to GZA Geoenvironmental, Inc. (GZA), "light contamination" was encountered during the removal of the older fuel oil UST in 1993, and the impacted soils were cleaned up at that time.

Wastewater from the R&D laboratories is discharged to the sanitary sewer pursuant to a permit. A 10,000-gallon underground diversion tank formerly associated with the lab wastewater discharge is present outside the southeastern side of the building. This tank was disconnected from the sanitary sewer line as part of the facility renovation conducted in 2000. Thus, the diversion tank is no longer subject to the potential for receipt of wastewater. Prior to 2000, in the event of a spill, wastewater could be diverted to the tank to prevent discharge to the sanitary sewer. Arch personnel indicated that there was never a need to use this tank.

Chemical wastes from the R&D laboratories are consolidated into 5 to 55-gallon drums and shipped off-site as hazardous waste. The amount generated by any one lab is small; however, the combined volume of waste produced by the formerly more than eighty on-site R&D laboratories rendered Arch a large quantity generator. Arch formerly operated an Interim Status Hazardous Waste Storage (IWS) area located in a small building outside the eastern side of the main building. This unit is no longer in use and RCRA Storage Unit Closure Plan Parts 1 to 3 were submitted to the Connecticut Department of Environmental Protection (CT DEP) pursuant to RCRA guidance. As discussed further below, the result of these submittals was that the IWS achieved clean closure in 2005. A virgin chemical storage room was also located in the southern side of the building. Arch has no record of a spill from this room.

As part of the Site redevelopment, a new <90-day waste storage area was constructed on the west side of the site building and was used by Arch beginning in January 2001. All wastes currently generated on-site are stored in the new <90-day storage area. This entire room is constructed to function as secondary containment. In addition, containment pans are present beneath the drums and containers in the room. An additional secondary containment device used for catching any spills while pouring contents of small containers into larger containers is located in the <90-day storage area. Bulk storage of virgin chemicals is also located in the new less than <90-day storage area. Bench top quantities are used and stored in the laboratories. No staining, cracks or leaks were observed in the <90-day storage area during an inspection conducted by ENSR in 2003 (ENSR, 2004a).

A grassy area located to the south of the facility was formerly used as a test area for swimming pool chemicals. The test area consisted of several above ground swimming pools. According to Arch personnel, the pools were used as part of the testing procedure to provide normal biological loading to the water.

GZA performed Phase I and Phase II assessments of the facility in 1999 through 2000. GZA reported that chiller condensate and non-contact cooling water were formerly directed to a floor drain in the mechanical room. From 1984 to 1988 this drain discharged water to a drainage swale located to the southeast of the facility. Approximately 4,000-gallons per day for approximately 150 days per year were discharged to Ten Mile River through this ditch; first under a CT NPDES permit and later as Minor Non-Contact Cooling Water. The water was reported to contain zinc at a concentration of 0.5 mg/L, chlorine, and phosphonate. Floor drains in laboratory areas were sealed when Olin purchased the facility in 1983.

GZA evaluated this outfall as part of their Phase II investigations. GZA installed well GZ-4 in an inferred downgradient direction from the drainage ditch. This well was sampled by GZA in October 1999 and,

with the exception of barium, no analytes were detected in groundwater in this area indicating that there is no residue in the environment from this discharge that exceeds Connecticut Remediation Standard Regulation (RSR) criteria.

In 2000, Alexion, a biopharmaceutical company, moved its corporate headquarters to the portion of the building vacated by Arch. Alexion does not conduct manufacturing at the facility; however, part of the Alexion headquarters is used for R&D laboratories. As a result, Alexion maintains status as a conditionally exempt small quantity generator indicating that they generate less than or equal to 100 kg of hazardous waste per month, accumulate no more than 1000 kg on site at any one time and no more than 100 kg of waste, soil, debris or residue that contains no more than 1 kg of "acute hazardous waste". Alexion waste consists primarily of small quantities of spent organic solvent associated with high-pressure liquid chromatography (HPLC), flammables (alcohols), some toxic compounds and used oil associated with vacuum pump operations. The used oil is not considered a hazardous waste. Alexion's waste storage room is located adjacent to Arch's former <90-day water storage room (Figure 2). Acid and base wastes are neutralized and discharged under best management practices (BMP) to the sanitary sewer.

During their tenancy at the building, Alexion has not had a reportable spill of any virgin or waste chemicals. However, one event occurred in February 2001 within the pH adjustment system. During this event, the sump overflowed and a turpentine-like odor was observed. Alexion notified the CTDEP; however, sample analysis proved that the material on the water that overflowed the sump was turpentine used in cleaning and the event was not considered a chemical spill because it was contained within the pH adjustment system. In addition, the overflow was confined to the system's secondary containment and nothing was released to the environment.

A site wide evaluation the facility was required under the Connecticut Transfer Act when the facility was divested from Olin Chemical to Arch Chemical in February of 1999 and a second Transfer Act requirement was triggered when the facility was sold to Winstanley Enterprises (Winstanley) on July 21, 2000. The Transfer Act assessment involved the collection of soil and groundwater samples from areas of concern (AOCs) located throughout the Site to evaluate whether the Site was in compliance with the Connecticut RSR or if remediation to achieve RSR compliance would be required. The investigations completed indicated that the Site met all applicable RSR soil and groundwater criteria and no remediation was necessary.

On March 30, 2004, ENSR submitted a Verification Report (ENSR, 2004a) to the CTDEP to bring the investigation and demonstration of compliance with the Connecticut RSR of the facility to regulatory closure. The Verification Report was audited by CTDEP and on August 16, 2004 CTDEP issued a letter indicating that the Verification was acceptable.

As discussed above, the facility formerly contained an IWS Unit. Arch operated this regulated unit under "interim status" as provided by 22a-449(c)-105 of the Regulations of Connecticut State Agencies and Section 3005 of RCRA. The IWS Unit was housed in a 575-square foot concrete and metal building with an eight-foot wide double door. The IWS Unit is on the eastern portion of the property. Wastes stored in the IWS Unit consisted of flammable liquids, acids, alkalis, mercury, and hazardous and non-hazardous solid wastes and liquids. The building is still present; however, it was decontaminated and was documented as a clean closure with no release to the environment identified. Public notice for the clean closure was published on August 3, 2005. However, as detailed by CTDEP in August 2006, because of the facility status full RCRA closure for the facility under Corrective Action also required a (1) drinking water well survey, (2) filing of the Quality Assurance Project Plan (QAPP), and (3) an ecological risk assessment. This SLERA represents the final deliverable requested by CTDEP in August 2006.

On January 8, 2009 CTDEP indicated that RCRA Environmental Indicator (EI) determinations were needed for current human health exposures under control and migration of contaminated groundwater under control. Both EIs were submitted in February 2009 and the groundwater migration EI was approved on June 16, 2009. The human health EI was updated in June 2010 to include the recently collected surface soil data and will be approved following CTDEP review.

1.2 SLERA Approach and Methodology

Conducting a SLERA is consistent with a tiered approach to ecological risk assessment appropriate for RCRA sites. Conducting assessments in a tiered, step-wise manner allows the risk assessor and risk manager to maximize the use of available site information and sampling data, while providing the opportunity to reduce the uncertainties inherent in the ecological risk assessment process through the use of focused supplemental data collection to fill key data gaps identified in the previous tier of the assessment, if necessary. The SLERA is considered the first tier of the ecological risk process. If the results of the SLERA indicate sufficient potential ecological risk, further ecological risk assessment may be warranted.

The SLERA for the Site was conducted following the general approach and methodology provided by the U.S. EPA's Framework for Ecological Risk Assessment (U.S. EPA, 1992), Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment, Interim Final. (U.S. EPA, 1997), Guidelines for Ecological Risk Assessment (U.S. EPA, 1998) and The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments (U.S. EPA, 2001a).

1.3 Organization of the SLERA

The SLERA is organized into the three following major sections suggested by EPA's Framework for Ecological Risk Assessment (U.S. EPA, 1992); these sections are Problem Formulation, Risk Analysis, and Risk Characterization. A brief description of the content and purpose of these sections are given below.

- Problem Formulation - In this phase, the objectives of the ERA are defined, and a plan for characterizing and analyzing risks is determined. Available information regarding stressors and specific sites is integrated. Products generated through problem formulation include assessment endpoints and conceptual site models.
- Risk Analysis - Risk analysis is directed by the problem formulation. During this phase of work, data are evaluated to characterize potential ecological exposures and effects.
- Risk Characterization - During risk characterization, exposure and stressor response profiles are integrated through risk estimation. Risk characterization also includes a summary of uncertainties, strengths, and weaknesses associated with the risk assessment.

The risk assessment process is frequently iterative, and new information brought forth during the risk characterization phase, for instance, may lead to a review of the problem formulation phase, or additional data collection and analysis.

The remainder of this SLERA is organized in the following manner: Problem Formulation (Section 2.0), Risk Analysis (Section 3.0), Risk Characterization (Section 4.0), Summary and Conclusions (Section 5.0), and References (Section 6.0).

2.0 Problem Formulation

Problem formulation is the initial systematic planning phase of the ecological risk assessment process. It provides the basis for the approach and methodology to be used as well as defining the specific scope and objectives of the risk evaluation.

The problem formulation phase of the SLERA includes the following:

- definition of risk assessment objectives;
- site characterization and definition of the geographic area to be considered;
- selection of specific ecological receptors and exposure pathways;
- selection of assessment and measurement endpoints;
- selection of COPC; and
- development of the conceptual site model (CSM).

2.1 Definition of Risk Assessment Objectives

The purpose of the risk assessment is to evaluate the extent to which compounds present at or released from the property may pose a threat to the environment.

2.2 Site Characterization and Definition of the Geographic Area to be Considered

The site characterization provides details regarding the Site. As described in Section 1.1, the facility was originally constructed in 1975, and occupied by Siemens, a medical equipment manufacturing company, from its construction until 1983 when it was acquired by Arch/Olin. Prior to 1975, the Site and surrounding area was under agricultural use.

The Arch facility is located in the Cheshire Industrial Park in Cheshire, Connecticut (Figure 1). Pertinent site features are illustrated on the Site Plan (Figure 2). The facility is bordered on three sides by other industrial/commercial properties within the Cheshire Industrial Park and Knotter Drive. The Arch property is bounded to the north by the Atlantic Inertial Systems (AIS), to the northwest by the Pratt and Whitney Cheshire Engine Center, and to the south by the Macy's/Bloomingdale's catalog/storage facility (Figure 3). These multi-acre sized structures and associated parking lots provide extensive impervious cover in the watershed and several of these facilities have large truck loading docks. In addition to these facilities, a large building was built at the corner of Knotter Drive and the long access road lead to the Macy's building. Other upstream land uses includes agricultural fields, wetland areas, and Interstate I-84.

The general layout of the industrial park and flat elevation indicates that many of the facilities are located on historically-filled wetlands, with poor drainage, and residual wetland areas existing in the periphery of the developed areas. The general pattern of natural drainage is west to east, with several water channels arising in hills to the west and eventually flowing to the Ten Mile River (see Figure 4).

The Site encompasses approximately 75 acres and is occupied by a 144,700 square foot building. The majority of the building is one story in height with small two story sections and is constructed of concrete

block on a slab foundation. Approximately 45 of the 75 total acres (60% of the property) are occupied by the building footprint, lawns, parking lot and service roads. The balance of the property, approximately 30 acres, is occupied by undeveloped wetlands, ponds, and wooded areas.

The Site is located in an area where groundwater is classified as GB, indicating that it is considered degraded and is not suitable for human consumption without treatment.

Site visits were conducted by AECOM ecologist Dr. David Mitchell on March 29, 2007 and February 24, 2009. These visits were intended to provide a qualitative habitat characterization, identify the on-Site ecological habitats and potential receptors, and to locate a drainage swale that historically discharged chiller condensate and non-contact cooling water to the Ten Mile River. This information was used to refine understanding of the Site and to identify whether complete exposure pathways potentially existed.

Potential ecological habitats located at or adjacent to the Arch Chemical property include: (1) maintained lawn areas, (2) adjacent upland wooded areas, (3) the Ten Mile River corridor, and (4) two large man-made impoundments located on-Site. The surrounding ecological habitats appear to be in good condition and providing appropriate ecological functions. Further information on the ecological habitats and associated receptors are described below.

2.2.1 Maintained Lawn Areas

Much of the developed area in the front (west) of the facility is open lawn areas consisting of maintained grass interspersed with trees. This area provides minimal habitat for foraging birds and small mammals and is regularly disturbed. During the March 2007 site visit there were a considerable number (120+) of Canada geese seen cropping the lawn areas, both on the Arch Chemical property and also on similar lawn areas on adjacent industrial/commercial facilities. Copious amount of goose feces on the soil indicates that these birds have a permanent (i.e., over-wintering) population. Foraging robins were also observed on the lawn areas. Similar observations of geese and associated feces were also made during the soil sampling conducted in November 2009.

2.2.2 Upland Wooded Areas

On three sides of the facility, the open lawn areas are bordered by thickets and woods. On the north side of the property, this vegetation is confined to an approximate 100 ft wide wooded riparian corridor through which a 7-ft wide man-made channel (drainage from man-made impoundment located in north-northwest corner) flows. The riparian strip acts as a narrow buffer between Arch Chemical property and the industrial property to the north. There is a natural gas pipeline right-of-way (ROW) which angles across the top section of the Arch property. This ROW includes both open lawn areas as well as an open grassed corridor where tree growth has been actively suppressed.

On the south side of the lawn and building footprint are undeveloped shrub thickets grading to saplings and then mature forest. The shrub coverage is not extensive. The shrub areas provide good habitat as they interface between lawn and forest areas. A cottontail rabbit was observed during the March 29, 2007 site visit, as was deer scat and small mammal burrows. Crow, cardinal, robin, and blue jay were identified by sight or call.

On the east side of the facility there is mature forest that extends to the Ten Mile River, which is located less than a quarter mile east of the facility building. These areas include uplands (including a mature beech stand), wetlands, and several vernal pools. These areas are typically expected to have forest birds and mammals and support amphibian life. Evidence of deer browse (i.e., cropped branches) was observed on small saplings and shrubs.

2.2.3 Ten Mile River Corridor

The local watershed drainage, including outflow from the two impoundments, goes to the east toward the Ten Mile River. This waterbody flows in a northeasterly direction until it confluences with the Quinnipiac River in Southington, CT. Near the Arch property, the river is approximately 20 feet wide and appeared to be 2 to 3 feet deep. There is a distinct floodplain associated with the river, as marked by elevation and the presence of wetland shrubs. The water was clear and flowing and generally free of suspended material. The substrate appears largely sandy and a non-hard substrate. Overhanging vegetation and backwater areas offer potential for fish foraging and refuge. It is not known if there is a coldwater fishery present. Great blue heron tracks were observed on the streambank indicating that this river supports piscivorous wildlife, such as the heron, and kingfisher, mink, and other piscivores may also be present.

2.2.4 Impoundments and Drainage Swale

Two man-made impoundments are located on the Arch Chemical property and a historic drainage swale is located in the wooded area behind the facility. These features may provide ecological habitat or constituent migration pathways and were the subject of the memorandum entitled "Inspection of two detention basins and former drainage swale at Arch Chemical facility" submitted to CTDEP on March 20, 2009.

2.2.4.1 Northern Detention Basin

One detention basin, approximately 1.5 acres in size, is located in the northwestern corner of the Site. This man-made waterbody was apparently excavated as part of the Knotter Drive industrial park development. This basin receives water from a headwater stream that originates just west of I-84. The stream flows northeast along the highway corridor before crossing under I-84 and going west toward the pond. There is a large detention basin on the Pratt & Whitney property which also drains towards the northern detention basin. Inspection of the local drainage and inlet structure (approximate 9-foot concrete inlet) at Knotter Drive indicates that local road runoff is routed to the northern detention basin, as well as lawn drainage from the Arch facility.

The shoreline of the basin is open and grassed to the waterline for about 2/3 of the periphery. This shoreline was fenced and signage indicated that this was a "Goose Population Control Area" – prohibiting feeding of the geese. The outlet area to the east is wooded and there were shrubs and grass near the major inlet. Ducks and geese have consistently been observed within the basin and periphery.

There is an unregulated outlet (i.e., no control structure) on the pond and downstream flow goes into a man-made channel that flows east through a wooded area between AIS and the Arch facility. Stormwater runoff from the Arch facility parking lots and roof runoff is routed to the stream via a central storm drain system which outlets directly to the stream. Stormwater from AIS drains off the drive and parking lot in three locations so that there is overland flow to the stream. Downstream of the Arch facility, the stream widens and eventually flows through wetlands into the Ten Mile River.

Arch has never used the undeveloped portion of the property surrounding the northern detention basin for industrial, waste storage, or waste disposal purposes. The northern detention basin receives stormwater runoff from Knotter Drive and other upstream facilities within the industrial park (e.g. Pratt & Whitney) with minimal overland flow from non-operations areas on the Arch property (lawn drainage along driveway). Currently there are no activities occurring at Arch that require stormwater monitoring and there is no reason to expect to find Site-related constituents in the northern detention basin.

2.2.4.2 Southern Detention Basin

The second impoundment is located in the south of the Arch Property in the drainage from wetland areas located near the gas pipeline ROW and then going southeast towards the Ten Mile River. A man-made impoundment created by an earthen berm approximately 5 feet wide is located in the southeastern portion of the property. This basin appears to pre-date the construction of the Knotter Drive industrial park (based on appearance on older USGS topographic maps) and may have originally been used for agricultural purposes. The earthen berm nearest the river is breached and water flows freely for approximately 150 to 200 feet into a loop of the Ten Mile River. The western end of the basin has filled in with a *Phragmites* monoculture. The open water area was estimated at approximately 2 to 3 acres and appears very shallow. The observable substrate was clayey with much leafy organic material and the water leaving the pond somewhat turbid. Approximately 12 ducks were on the pond during the February 2009 site visit.

The watershed of the southern detention basin drains wetland areas to the west and southwest of the Arch facility (crossed by natural gas pipeline corridor). In addition, drainage crosses the access road to the Macy's facility near the newly constructed building on Knotter Drive. Stormwater on the access road is routed to wetlands on either side. There is also a flooded channel parallel to the pavement on the north side of the Macy's facility near the truck loading area. Based on these observations, it appears that stormwater is indirectly routed to the southern detention basin. Since the stormwater flows into the wetlands and/or recharges the groundwater before discharge to the southern detention basin, it is likely that water quality in that basin is less impacted by stormwater, compared to the northern detention basin.

The condition of the southern detention basin indicates that it is not actively maintained and has not been for some time. The eastern berm is fully vegetated and currently pierced by a large (8 ft wide) opening that appears to be quite old. Based on the shallow appearance of the pond, the invasion of emergent vegetation at the western (upstream) end, and the appearance of the banks along the northern edge, the basin holds much less water than when originally constructed. The appearance of the shoreline suggested that the water elevation fluctuates and the basin may be periodically or seasonally flooded. This would be consistent with seasonal periods of high groundwater and/or the influence of stormwater discharges from facilities located on Knotter Drive.

Inspection of the northern shoreline did not indicate a sediment delta associated directly with the drainage swale described below. There was no indication that the drainage swale ever flowed into the southern detention basin. There is a small but deeply eroded channel, near the boundary between open water and the emergent wetland vegetation. This channel is no more than 30 feet long and appears only to drain runoff from a relatively flat wooded area. Due to the eroded nature of the channel, it is difficult to determine whether this channel occurred naturally or was man-made quite some time ago.

2.2.4.3 Drainage Swale

Based on the historic discharge permit, the wooded area behind the Arch facility was inspected for the drainage swale associated with the discharge of chiller condensate and non-contact cooling water identified by GZA and described in Section 1.1. The swale is located off the southeast corner of the building's southern extension, currently behind a pile of wooden pallets. The drainage swale starts at a 5-foot concrete headwall which contains a half-buried pipe. The channel is approximately 120 feet long and one to two feet deep. The southern bank is higher and appears to be the result of sidecast material during the swale creation. The banks of the swale are heavily vegetated with shrubs and trees.

At the end of the swale there was accumulation of woody plant material and other debris. Beyond the end of the swale, there was no clear indication that flow went through the wooded area. The topography and vegetation did not indicate that an organized flow was presently occurring. There was no indication that the discharge ever flowed into the southern detention basin and the current condition of the swale and vegetation located downstream of its southeastern end indicates that it has not discharged flow to the wooded area to the southwest of the facility for quite some time.

2.3 Selection of Specific Ecological Receptors and Exposure Pathways

Ecological receptors are the components of ecosystems (i.e., species or sensitive habitats) that are or may be adversely affected by a chemical, physical, or biological stressor. Receptors can be any part of an ecological system, including species, populations, communities, and the ecosystem itself. The SLERA focused on the pathways for which (1) chemical exposures are the highest and most likely to occur, and (2) there are adequate data pertaining to the receptors, exposure pathways, and toxicity for completion of risk analyses.

Potentially complete exposure pathways for ecological receptors were identified through relevant Site documents and the previously described site visits. The primary exposure pathways evaluated in the SLERA are the direct exposure of terrestrial receptors to surface soils and direct exposure of aquatic receptors to surface water.

Since the historic soil data were collected from relatively deep horizons for compliance with the requirements of the Connecticut Transfer Act Site Investigation, Verification and RCRA Clean Closure they were not appropriate for use in the SLERA. Therefore, surface soil samples were collected in November 2009 from the 0 to 2 foot horizon at 11 Site and 3 background locations.

There is no evidence of direct surface water discharges from the Site to the detention basins or Ten Mile River. There is also no evidence of a mobile groundwater plume on-Site that would discharge to a surface waterbody or wetland. The undeveloped portion of the property surrounding the northern detention basin has never been used for industrial, waste storage, or waste disposal purposes and there is no reason to expect to find Site-related constituents in the northern detention basin. Therefore, potential exposure pathways are incomplete and the northern detention basin is not considered further in the SLERA.

The only historic surface water discharge was via the drainage swale which discharged into a wooded area behind the Arch facility. Once surface water discharged into the wooded area, it could infiltrate into groundwater and be discharged into a downgradient waterbody or wetland. In the absence of a direct surface water connection, historic on-Site groundwater data were used to evaluate potential impacts to aquatic receptors. A dilution attenuation factor (DAF) was applied to the available groundwater data to represent potential surface water concentrations in downgradient waterbodies or wetlands.

Previous investigations completed at the Site did not identify a mobile plume that could impact surface water (ENSR, 2004a) and the EI for groundwater indicated that compliance with CT Remediation Standard Regulations (RSRs) for groundwater at the Site had been demonstrated and that remediation was not necessary. Previous reports compared the groundwater data against the RSR Surface Water Protection Criteria (SWPC), which are criteria intended to protect the quality of a surface waterbody, wetland area, or intermittent stream to which a groundwater plume discharges (if present). Therefore, due to the lack of a direct surface water discharge or an identified groundwater plume this groundwater evaluation represents a very conservative evaluation of potential impact to aquatic receptors.

2.4 Threatened/Endangered Species and Species of Special Concern

A review of the CTDEP State and Federal Listed Species and Significant Natural Communities Map for the town of Cheshire indicated that the facility is approximately ½ mile upstream of a Natural Diversity Data Base (NDDDB) Area of Concern. Based on this information, a request for review was submitted to the Connecticut NDDDB on March 9, 2007. Responses from the NDDDB are provided in Appendix A.

The May 4, 2007 response from the NDDDB indicated that four State Species of Special Concern may occur in the vicinity of the facility: eastern box turtle (*Terrapene carolina*), wood turtle (*Glyptemys insculpta*), eastern ribbon snake (*Thamnophis sauritus*), and hognose snake (*Heterodon platirhinos*). Additional habitat information was provided by a CTDEP wildlife biologist on May 11, 2007. It is possible that these species could be found within the wooded areas and riparian zones near the facility. However, no observations of these turtles or snakes have been noted.

2.5 Selection of Assessment and Measurement Endpoints

According to the U.S. EPA (1998), assessment endpoints are formal expressions of the actual environmental value to be protected. They usually describe potential adverse effects to long-term persistence, abundance, or reproduction of populations of key species or key habitats. Measurement endpoints are the physical, chemical, or biological aspects of the ecological system that are measured to approximate or representative assessment endpoints. Measurement endpoints are often stressor-specific and are used to evaluate the assessment endpoint with respect to potential ecological risks. The endpoints are presented below.

- Assessment Endpoint 1: The assessment endpoint is the sustainability of terrestrial invertebrate and plant communities in the vicinity of the Site typical of comparable Connecticut upland areas.
 - Measurement Endpoint 1-1: Comparison of soil analytical chemistry results to ecological soil screening values. Concentrations in excess of ecological soil screening values are considered indicative of a potential for ecological risks.
- Assessment Endpoint 2: The assessment endpoint is the sustainability of aquatic invertebrate, fish, and plant communities in aquatic habitats in the vicinity of the Site typical of comparable Connecticut aquatic habitats with similar morphology and hydrology.
 - Measurement Endpoint 2-1: Comparison of groundwater analytical chemistry results to surface water screening values for the protection of aquatic life. To account for the fact that aquatic receptors are not directly exposed to groundwater, a Dilution Attenuation Factor (DAF) is applied. Concentrations of groundwater, with the DAF applied, in excess of surface water screening values are considered indicative of a potential for ecological risks.

2.6 Method for Selection of COPCs

COPCs are a subset of the complete list of constituents detected in media in the area under investigation that are carried through the quantitative ecological risk assessment process. COPCs represent the constituents detected in the environmental media that could present a potential risk for ecological receptors.

To identify COPCs, detected constituent concentrations in surface soil and surface water (i.e., groundwater with DAF applied) were compared to media specific ecological screening values. Soil screening levels are presented in Table 1 and surface water screening levels are presented in Table 2. These ecological screening values are based on conservative endpoints and sensitive ecological effects

data. They represent a preliminary screening of Site contaminant levels to determine if there is a need to conduct further investigations at the Site; however, they should not be used as remediation levels.

Literature-derived soil screening levels were selected to evaluate potential impacts to terrestrial invertebrates and plants using the following hierarchy:

- Ecological Soil Screening Levels (Eco-SSLs) developed according to U.S.EPA guidance (U.S. EPA, 2005);
- U.S. EPA Region 4 soil screening levels (U.S. EPA, 2001b); and
- U.S. EPA Region 5 Ecological Screening Levels (ESLs) for soil (U.S. EPA, 2003).

Sources for surface water screening values were considered in this order:

- Connecticut Water Quality Standards for aquatic life (CTDEP, 2002);
- Federal Ambient Water Quality Criteria for aquatic life (U.S. EPA, 2006); and
- Secondary Chronic Values developed by Oak Ridge National Laboratories (Suter and Tsao, 1996).

If none of these values were available, the on-line Ecological Benchmark Tool (http://rais.ornl.gov/tools/eco_search.php) was used to search for applicable surface water benchmarks. This tool contains a comprehensive set of ecotoxicological screening benchmarks compiled by Oak Ridge National Laboratory (ORNL).

Constituents with maximum exposure point concentrations (EPCs) less than their respective constituent-specific risk-based screening value were not retained as COPCs; constituents with maximum EPCs in excess of the screening values were retained as COPCs. If no screening value was available, the constituent was selected as a COPC. Identification and evaluation of COPCs is presented in Section 3.

Non-detected constituents were also compared to the appropriate screening values in the uncertainty evaluation presented in Section 4.3. Constituents with detection limits above the screening values were retained as COPCs in the uncertainty discussion.

2.7 Conceptual Site Model

The end product of the problem formulation step is the development of a CSM. The CSM for the Site summarizes the current knowledge of the Site and ecological resources potentially at risk. The CSM is a set of working hypotheses regarding how ecological receptors at the Site may be exposed to contaminants. The CSM helps to describe the origin, fate, transport, exposure pathways, and receptors of concern.

A CSM for the Site is included as Figure 5. The CSM displays the relevant exposure pathways through which groups of ecological receptors may be exposed to COPCs in each environmental medium at the Site. The objective of the CSM is to identify the ecologically important exposure and migration pathways, and to specify exposure scenarios evaluated in the SLERA.

The potential sources of constituents at the Site were considered to be related to historic production and storage activities. Constituents associated with a suspected historic UST release near the IWS unit may be present in groundwater and soil. Constituents associated with chiller condensate and non-contact cooling water released to the historic drainage swale in the forested area southeast of the facility may be

present in soil or groundwater that may discharge to downgradient waterbodies. The potential exposure pathways for ecological receptors at the Site are associated with surface soil or surface water impacted by the discharge of groundwater.

Although ecological food chains exist in the vicinity of the Site, the groundwater and soil evaluated in the SLERA generally lack elevated concentrations of bioaccumulative compounds. In addition, wildlife receptors are not likely to be exposed to groundwater or deeper soils where releases may have occurred. Therefore, vertebrate wildlife food chain exposure pathways are not believed to represent a significant potentially complete ecological exposure pathway, and were not evaluated in the SLERA. The majority of chemical stressors are inorganic constituents or volatile compounds presumed to be related to former operations at the Site. The primary potential effects associated with exposure to these COPCs at the Site are related to direct toxicity, rather than indirect (e.g., food chain) effects.

3.0 Risk Analysis

The risk analysis phase of the SLERA is based on the CSM developed in problem formulation. Risk analysis includes the characterization of potential ecological exposure and corresponding effects. The ecological exposure assessment involves the identification of potential exposure pathways and an evaluation of the magnitude of exposure of identified ecological receptors. The ecological effects evaluation describes the potential adverse effects to ecological receptors from exposure to COPC in environmental media.

3.1 Terrestrial Receptor Risk Analysis

Terrestrial invertebrate and plant communities in the upland portions of the Site may potentially be exposed to COPCs from direct contact with soil. To assess potential risks to these receptors, measurement endpoints include evaluation of available analytical chemistry data and comparison to screening benchmarks identified in Section 2.5 and comparison to concentrations detected in three soil samples collected from areas of the property not expected to be impacted by Site activities.

Surface soil (0-2 ft) samples were collected on November 9, 2009 with oversight by CTDEP and U.S. EPA. Eleven samples were collected from locations potentially impacted by Site activities (SS-01 through SS-11) and three samples were collected from background sampling locations within the facility property (SS-12, SS-13, and SS-14). Samples were analyzed for metals, VOCs, and SVOCs (including polycyclic aromatic hydrocarbons (PAHs)). Appendix B presents the data quality assessment of the analytical data and Appendix C presents the individual sample results.

Figure 6 presents the sampling locations and the rationale for the sampling locations is summarized below:

- SS-01, SS-02, and SS-03 – ‘In channel’ samples collected within the 120 ft drainage swale at approximately 40 ft intervals.
- SS-04 – Sample collected within wooded area approximately 40 ft from the end of the 120 ft drainage swale.
- SS-05 – Sample collected where the 30 ft channel discharges into the southern detention basin.
- SS-06 – Sample collected within lawn area adjacent to the southeastern corner of the IWS building.
- SS-07 – Sample collected within lawn area downgradient of the IWS building and the closed-in-place UST and leaching pit.
- SS-08 – Sample collected within lawn area adjacent to the closed-in-place 1,500 gallon UST and leaching pit.
- SS-09 – Sample collected within lawn area adjacent to the 20,000 gallon fuel oil UST.
- SS-10 – Sample collected within lawn area downgradient of the 20,000 gallon fuel oil UST.
- SS-11 – Sample collected within wooded area downgradient of the former leach field.

- SS-12 – Background sample collected from location in wooded area to the west of the facility buildings. This sampling location was moved from the proposed sampling location within the wetlands at southern end of property due to a lack of access. CTDEP and U.S. EPA personnel agreed to the re-location of this sample during the November 2009 sampling event.
- SS-13 – Background sample collected within the open lawn area to the west of facility buildings mid-way between the building and Knotter Drive.
- SS-14 – Background sample collected at northern end of property. Sample was collected closer to stream channel than property boundary to avoid influence of parking lot runoff from adjacent property.

Since PAHs typically occur in the environment as complex mixtures, rather than as single chemicals, and since the mode of toxicity of individual PAHs is similar and is assumed to be additive, PAHs were evaluated as total PAHs, as well as the totals of the total high molecular weight (HMW) and low molecular weight (LMW) PAHs. The evaluation of these total PAH values is likely to provide a more realistic estimate of potential toxicity to ecological receptors than the evaluation of the individual PAHs.

To determine the total PAH, HMW PAH, and LMW PAH values, the individual PAHs within a sample were summed together. If an individual PAH was detected at least once, the detection limit was used as a proxy concentration in the calculation of the PAH totals for those instances in which the chemical was reported as undetected. Therefore, the total PAH values are based on the 11 that were detected in the Site soils (see Appendix C). These PAH totals represent a conservative estimate of the PAHs within an individual sample (i.e., since they include both detected and undetected individual PAHs within a single sample). Several of the PAH totals were based on the sum of detection limits (i.e., none of the individual PAHs were detected within that sample)

As described in Section 2.5, the ecological screening values identified in Table 1 are based on conservative endpoints and sensitive ecological effects data and they represent tools used for a preliminary screening of surface soil concentrations. Table 3 identifies the surface soil COPCs based on the comparison of the maximum detected concentrations from the 11 samples collected from potentially Site-impacted areas in November 2009 against the soil screening levels. The soil COPCs retained in Table 3 include one VOC (2-butanone) retained due to a lack of a screening level and two metals retained due maximum concentrations above the associated screening level. None of the total PAH values were retained as COPCs.

3.2 Aquatic Receptor Risk Analysis

As described in Section 2.3, there is no evidence of direct surface water discharges from the Site to the detention basins or Ten Mile River. There is also no evidence of a mobile groundwater plume on-Site that would discharge to a surface waterbody or wetland. However, aquatic invertebrate, fish, and plant communities in the aquatic habitats of the Site may potentially be exposed to COPCs from direct contact with surface water following the potential discharge of impacted groundwater associated with the drainage swale. To assess potential risks to these receptors, measurement endpoints include evaluation of available analytical chemistry data and comparison to screening benchmarks identified in Section 2.5.

In the absence of a direct surface water connection, historic on-Site groundwater data were used to evaluate potential impacts to aquatic receptors potentially exposed to impacted groundwater discharging into downgradient waterbodies or wetlands. The groundwater data set evaluated in the SLERA is consistent with that considered in the Verification Report (ENSR, 2004a) and represents data collected from 14 monitoring wells between October 1999 and February 2002. Appendix D presents the individual

sampling results available from the Verification Report. Figure 6 presents the locations of the monitoring wells sampled for groundwater.

The groundwater data set available from the Verification Report (ENSR, 2004a) focused on analytes that had been detected at least once in the groundwater. Therefore, detection limits are lacking for those constituents that were never detected in groundwater. This uncertainty is discussed in Section 4.3. However, due to the conservative nature of the surface water evaluation (i.e., no evidence that a surface water or groundwater discharge to a waterbody or wetland has occurred), the focus on detected groundwater constituents is considered appropriate.

As described in Section 2.5, the ecological screening values identified in Table 2 are based on conservative endpoints and sensitive ecological effects data and they represent tools used for a preliminary screening of surface water concentrations. Table 5 identifies the surface water COPCs based on the evaluation of the maximum detected concentrations in the groundwater data set. Prior to the screening a DAF of was applied to the maximum detected groundwater concentration to account for the reduction in constituents between the groundwater source and discharge to a surface waterbody. The surface water COPCs retained in Table 5 include one VOC (chloroethane) retained due to a lack of a screening level and four VOCs and three metals retained due maximum concentrations above the associated screening level.

4.0 Risk Characterization

Risk characterization provides a quantitative evaluation of the potential for adverse ecological impacts due to COPCs in an area of concern. The conclusions regarding overall risk to ecological receptors are based on a weight-of-evidence approach, which integrates the results of all components of the assessment methodology (i.e., an approach that integrates results of benchmark screening and field observations to draw risk-based conclusions). The weight-of-evidence components is designed to provide measures of potential risks for different ecological receptors and exposure pathways, and provides relative measures of exposure and effects in the Site.

The results of the environmental risk analysis are analyzed and interpreted to determine the likelihood of adverse environmental effects, and to determine whether a conclusion of no significant risk can be reached for each assessment endpoint evaluated. This ecological risk characterization summarizes the results of the risk analysis phase of work and provides an interpretation of the ecological significance findings.

4.1 Terrestrial Receptor Risk Characterization

Terrestrial invertebrate and plant communities in the upland portions of the Site may potentially be exposed to COPCs from direct contact with soil. Potential risk to terrestrial invertebrates and plants was quantitatively evaluated by calculating screening hazard quotients (HQs). Screening HQs were calculated for each COPC by comparing the detected concentrations of the COPCs in each sample to the appropriate sediment screening value using the following formula:

$$\text{Hazard Quotient} = \text{Detected Concentration} / \text{Ecological Screening Value}$$

When the HQ was less than 1 (i.e., the concentration was less than the soil screening value), the constituent exposure was assumed to fall below the range considered to be associated with adverse effects for growth, reproduction, or survival of individual receptors, and no population level risks were assumed to be present. For HQ values greater than 1, further evaluation of potential risk may be warranted to evaluate the potential for risk to terrestrial receptors.

Exceedances of the ecological screening values may indicate the need for further evaluation of the potential ecological risks, but does not necessarily imply an ecological risk. The decision concerning the necessity for further evaluation requires the weighing of such factors as the frequency, magnitude, and pattern of these exceedences.

As indicated in Section 3.1, the soil COPCs included one VOC (2-butanone) and two metals retained due maximum concentrations above the associated screening level. To further evaluate the potential for risks to terrestrial invertebrates and plants, the results for the individual sampling locations were compared against the soil screening levels. Table 4 presents the sample-by-sample screening of the surface soil concentration data for the 11 Site locations.

No screening value was identified for 2-butanone so a quantitative evaluation could not be conducted. However, this VOC was only detected once (90 ug/kg in SS-05) at a level that is below most of the soil screening levels available for other VOCs (U.S. EPA, 2001b; U.S. EPA, 2003). Therefore, adverse impacts to terrestrial invertebrates or plants due to 2-butanone are not expected.

Concentrations of chromium and vanadium exceeded the associated screening values in all 14 soil samples. The HQs in the 11 Site locations ranged up to 47.5 for chromium and 14 for vanadium. Both the chromium and vanadium screening levels were derived by ORNL (Efroymson, et al., 1997a,b) based on small data sets so, as stated by the authors, the confidence in these values is low. In addition, these data were considered to be insufficient for the development of Eco-SSLs for plants or soil invertebrates. Therefore, exceedance of these screening levels does not necessarily indicate that impacts to plants or soil invertebrates would be expected.

4.2 Aquatic Receptor Risk Characterization

As described previously, there is no evidence of a Site release to the northern detention basin so this waterbody did not warrant quantitative evaluation in the SLERA. Potential discharges to the southern detention basin were investigated through multiple site visits and the review of historical documentation. These investigations found no evidence that the drainage swale discharged into the southern detention basin. A small eroded channel was identified along the northern shoreline of the southern detention basin, but this channel is not connected to the facility. A soil sample collected at the confluence of the channel with the basin (SS-05) did not identify elevated levels of metals, VOCs, or SVOCs. There is also no evidence of a mobile groundwater plume on-Site that would discharge to surface waterbodies or wetlands. The only historic surface water discharge was via the drainage swale which discharged into a wooded area behind the Arch facility. Once surface water discharged into the wooded area, it could infiltrate into groundwater and be discharged into a downgradient waterbody or wetland.

Aquatic invertebrate, fish, and plant communities in the aquatic habitats of the Site may potentially be exposed to COPCs from direct contact with surface water impacted by the discharge of groundwater. Potential risk to aquatic receptors was quantitatively evaluated by calculating screening HQs, as described in Section 4.1 based on the predicted surface water concentrations (i.e., groundwater with DAF applied) and the associated surface water screening values.

As indicated in Section 3.2, the surface water COPCs included five VOCs and three metals. To further evaluate the potential for risks to aquatic receptors, the results for the individual monitoring wells were compared against the surface water screening levels. Appendix D presents the groundwater data previously evaluated in the Verification Report (ENSR, 2004b). When multiple results were available for a monitoring well, the most recent data were evaluated.

Table 6 presents a sample-by-sample evaluation of the estimated surface water concentrations based on the most recent round of sampling in each monitoring well. As indicated previously, the groundwater data, with a DAF of 10 applied, is being considered as the surrogate for potential on-Site surface water exposure. Five VOCs (chloroethane, toluene, ethylbenzene, total xylenes, and chloroform) and three metals (barium, cadmium, and lead) were retained as COPCs for the surface water evaluation. However, total xylenes, chloroform, and lead were not detected in the most recent round of groundwater sampling in any monitoring well. Although the detection limits for xylenes and chloroform were generally below the ecological screening value, this was not the case for the lead data. The uncertainties associated with these detection limits are discussed in Section 4.3.

No screening value was available for chloroethane which was only detected in GZ-3 in 2002. The estimated surface water concentration of 22 ug/L is below most of the surface water screening levels available for other VOCs (Suter and Tsao, 1996; TNRC, 2001). Therefore, adverse impacts to aquatic receptors due to chloroethane are not expected.

The estimated surface water concentrations (i.e., groundwater with DAF applied) of toluene and ethylbenzene were below the associated ecological screening values in the most recent round of sampling indicating that adverse impacts to aquatic receptors due to VOCs in groundwater are not expected. The estimated surface water concentration of cadmium was equal to the ecological screening value in GZ-7; however, cadmium was not detected in the downgradient well MW-2. Therefore, although the estimated surface water concentration of cadmium detected at GZ-7 is equal to the screening value, Site data demonstrate that there is no plume of cadmium present and adverse impacts to aquatic receptors due to cadmium are not expected.

Estimated surface water concentrations of barium exceeded the ecological screening value in GZ-4, GZ-7, GZ-10, GZ-11, MW-1, MW-2, and MW-3 with a maximum HQ of 16.9 in GZ-10 in February 2002. The detections of barium in the most recent round of sampling are similar to levels detected in other groundwater samples across the Site, suggesting that they are background levels (ENSR, 2004a). Therefore, barium in groundwater is not expected to be the result of Site-related releases.

As indicated on Figure 6, monitoring wells GZ-4, GZ-7, GZ-10, GZ-11, MW-1, MW-2, and MW-3 are not located near a surface waterbody (e.g., northern or southern detention basin, Ten Mile River) so these predicted groundwater concentrations, even with the application of the DAF, are likely to over-estimate downgradient surface water concentrations. Previous investigations have not identified a mobile groundwater plume that could impact surface water (ENSR, 2004a) and the EI for groundwater indicated that compliance with CT RSRs for groundwater, which include a SWPC, had been demonstrated and that remediation was not necessary. Adverse impacts to aquatic receptors due to groundwater discharge to surface water are not expected due to the lack of a plume that could discharge to surface water and the low levels of COPCs present in groundwater are not expected to result in significant impacts if a discharge was to occur.

4.3 Uncertainty

The objectives of the uncertainty evaluation are to discuss the assumptions of the SLERA process that may influence the risk assessment results and conclusions and to discuss data gaps and associated ramifications on the level of confidence in risk management decisions.

The risk screening is based on the assumption that all constituents are 100% bioavailable and that the most sensitive life stages of all organisms are present. The screening values are very conservative and often based on toxicity tests performed with very sensitive test organisms. These factors are likely to over-estimate the actual risk to receptors at the Site.

A DAF of 10 was applied to the available historic groundwater data to represent surface water concentrations; however, this DAF is likely to over-estimate risks associated with surface water. There is no evidence that a groundwater plume exists on-Site or that it discharges to surface water. Therefore, the groundwater evaluation is very conservative.

The screening values used in COPC selection do not generally account for possible synergistic, antagonistic, or additive effects of contaminant mixtures. These factors may result in an under-estimate or over-estimate of potential risks.

Screening values were not available for 2-butanone which was detected in soil or chloroethane which was detected in groundwater so these constituents could not be quantitatively evaluated. However, it is expected that impacts due to 2-butanone and chloroethane would be similar to other VOCs and a review

of screening levels for other VOCs in soil and surface water indicate that levels of these two COPCs are unlikely to result in adverse impacts to ecological receptors.

It is possible that some constituents are present in environmental media at concentrations below detection limits, potentially resulting in an under-estimate of risks. To address this uncertainty, the detection limits for the recently collected surface soil data were compared to ecological screening values selected according to the hierarchy presented in Section 2.6. Table 7 presents the range of detection limits for the 125 constituents that were never detected in the 11 soil samples collected in November 2009 and identifies those detection limits that were above the associated screening values. The maximum detection limits for 17 SVOCs and three metals were above the ecological screening values; therefore these constituents are identified as soil COPCs in Table 7.

Although there is some uncertainty as to the specific chemicals used on-Site, particularly prior to 1983, the analysis of VOCs, SVOCs, and metals is expected to address the materials used on-Site. The non-detect COPCs do not represent constituents that were previously detected in soils evaluated in the Verification Report (ENSR, 2004a); with the exception of bis(2-ethylhexyl)phthalate which was detected in a sample collected from a test pit (1,800 ug/kg in GP-TP2 in 2001) within the facility building (i.e., not within an area of ecological habitat). However, the detection limits for the historic soil data (i.e., data considered in the Verification Report) were selected to allow comparisons with the RSRs for residential direct exposure and groundwater mobility and may not be below all of the current ecological screening values.

The assessment endpoint for the soil evaluation was the sustainability of terrestrial invertebrate and plant communities in the vicinity of the Site. However, plants and invertebrates were not the basis for the derivation for all of the screening values selected according to the hierarchy in Section 2.6 and presented in Table 7. Protection of higher trophic level wildlife receptors, not plants or terrestrial invertebrates, was the basis for the derivation of at least 14 of the soil screening values for the 17 SVOCs (i.e., most of the Region 5 ESLs were derived to be protective of shrews and voles; the basis for some Dutch-based Region 4 values is not clear). A review of plant and soil invertebrate based screening levels derived by ORNL (Efroymson, et al., 1997a,b) indicates that screening levels derived for plants and soil invertebrates are generally much higher than the wildlife based values .

For example, plant based values for phthalates ranged from 100 to 200 mg/kg while the Region 5 ESLs for butylbenzylphthalate and bis(2-ethylhexyl)phthalate were orders of magnitude lower; 0.239 to 0.925 mg/kg, respectively. Similar results were found for 2-chlorophenol (using 3-chlorophenol as a surrogate), 2-nitrophenol (using 4-nitrophenol as a surrogate), aniline (using multiple anilines as surrogates) and hexachlorocyclopentadiene. For pentachlorophenol and phenol, ORNL derived values were higher than Dutch based values from 1994 used by Region 4 (plant based value of 3 mg/kg for pentachlorophenol and invertebrate based value of 30 mg/kg for phenol). Although specific surrogates were not identified for all 17 SVOCs, this trend of higher screening levels for plants and invertebrates indicates that adverse impacts to these receptors from these COPCs are not expected. The detection limits for the 17 SVOCs were well below this range of plant and invertebrate based screening values.

The screening values for the three metals retained as COPCs in Table 7 were derived to be protective of plants (selenium and thallium) and soil invertebrates (mercury). However, this does not necessarily indicate that receptors are at risk if these values are exceeded by the detection limits. For example, all selenium detection limits are well below invertebrate based screening values derived by ORNL (70 mg/kg) and the Eco-SSL for soil invertebrates (4.1 mg/kg). Mercury detection limits are well below the plant based screening value derived by ORNL. No observations of stressed vegetation were noted during the site visits, many samples were collected from mowed and maintained lawn areas (not natural

ecological habitats), and sampling locations outside the maintained lawn areas were well vegetated. In addition, mercury and thallium detection limits were below the screening values in several samples and the maximum detection limits were generally close to the screening values. These results indicate that adverse impacts from these non-detect COPCs are not expected.

No known releases to surface soil have occurred so impacts to plants and invertebrates are not expected due to exposure to Site-related constituents. However, it is expected that, if a release to the surface soil had occurred, the evaluation of the detected COPCs would also address co-located constituents present below the detection limits. Therefore, although the presence of constituents in surface soil at concentrations below detection limits represents a source of uncertainty in the SLERA, it is unlikely that these non-detect COPCs represent a significant source of risk for terrestrial receptors.

The review of groundwater detection limits focused on the range of detection limits for the 25 constituents that were detected in groundwater between October 1999 and February 2002. Although the lack of screening detection limits for other historic groundwater samples represents a data gap, it is not expected that this will have a significant impact on the results of the SLERA since the detection limits for the historic data would have been selected to achieve RSRs (including SWPC), and there is no evidence that a groundwater plume exists on-Site or that it discharges to surface water. As indicated in Table 8, the estimated detection limits for the surface water (i.e., the groundwater detection limits with the DAF applied) were generally below the associated surface water screening values. Only the maximum estimated detection limits for barium, copper, and lead were above the associated surface water screening values. Therefore, there is some uncertainty in the quantitative evaluation of these data. However, these constituents were detected in some samples and the detection limits in other samples were below the surface water screening values. The estimated maximum detection limits were also quite close to the screening values. Since detected concentrations of these constituents were evaluated and these constituents were detected at similar levels across the Site (indicating the likelihood they are background levels (ENSR, 2004a)), it is unlikely that these non-detect COPCs represent a significant source of risk for aquatic receptors.

4.4 SLERA Scientific/Management Decision Point

At the end of the SLERA, a scientific/management decision point (SMDP) is reached when a conclusion can be made that either (1) the available data indicate the potential for ecological risk and further investigation is warranted, (2) the available data indicate either no or low potential for ecological risk and no further work is warranted, or (3) there are data gaps that must be addressed before the presence or absence of risk can be concluded (e.g., additional sampling or analysis). Where the results of the SLERA cannot reach a conclusion of "no unacceptable risk", further ecological risk assessment may be warranted.

The SMDP based on the comparison of surface soil data to conservative ecological soil screening values is that further investigation is warranted to evaluate the potential for risks associated with exposure to chromium and vanadium. Appendix E provides additional evaluation of these two soil COPCs.

The SMDP based on the comparison of groundwater data, with DAF applied, to conservative ecological surface water screening values is that the available data indicate no potential for ecological risk due to surface water exposure and no further work is warranted.

5.0 Summary and Conclusions

This purpose of this section is to summarize and evaluate the results of the SLERA conducted at the Arch facility located at 350 Knotter Drive in Cheshire, Connecticut and provide an interpretation of the magnitude of potential ecological risk and its significance. This SLERA was conducted to provide a conservative evaluation of potential ecological risks posed by Site-related constituents as part of the site-wide RCRA Closure process. Ecological risk assessment provides a context for Site-specific information that may be used in risk decision-making. An evaluation of the results for each of the individual assessment endpoints is contained below.

5.1 Terrestrial Receptor Summary

The assessment endpoint for the terrestrial evaluation was the sustainability of terrestrial invertebrate and plant communities in the vicinity of the Site typical of comparable Connecticut upland areas. This endpoint was evaluated through the comparison of recently collected surface soil data against ecological soil screening values.

As indicated in Table 3, the soil COPCs included one VOC and two metals. None of the PAH totals were retained as COPCs. The three COPCs were evaluated relative to the screening values on a sample-by-sample basis in Table 4. This evaluation indicated that concentrations of the organic COPC were unlikely to be associated with adverse impacts to terrestrial invertebrates and plants. The two inorganic COPCs exceeded the ecological screening values at all Site locations. However, exceedance of these conservative values does not necessarily indicate that adverse impacts are occurring. The SMDP reached at the end of the soil screening indicated that additional evaluation was warranted for the two COPCs (chromium and vanadium). Appendix E provides an additional evaluation of these COPCs relative to concentrations detected in background soil samples. All of the chromium and vanadium concentrations in the Site samples were within the range of background concentrations indicating that conditions on-Site are consistent with background.

An evaluation of the detection limits for the constituents never detected in soils indicated that the maximum detection limits for 17 SVOCs and three metals were above the ecological screening values. This results in some uncertainty in the terrestrial evaluation since it is possible that these constituents are actually present in environmental media at concentrations below detection limits, but above ecological screening values. Based on a review of additional soil screening levels, the lack of observations of stressed vegetation, the well vegetated condition of sampling locations, and the lack of any known release to surface soils, it is unlikely that these non-detect COPCs represent a significant source of risk for terrestrial invertebrates or plants.

The results of the quantitative evaluation of the detected surface soil concentrations against ecological screening values, the COPC refinement step, and the consideration of the detections limits, indicates that Site-related constituents do not appear to be posing a potential for significant risk to terrestrial invertebrates or plants. Therefore, no further evaluation of surface soil at the Site is warranted.

5.2 Aquatic Receptor Summary

The assessment endpoint for the aquatic evaluation was the sustainability of aquatic invertebrate, fish, and plant communities in aquatic habitats in the vicinity of the Site typical of comparable Connecticut

aquatic habitats with similar morphology and hydrology. This endpoint was evaluated through the evaluation of the historic groundwater data as a surrogate for surface water data. Concentrations of groundwater, with the DAF of 10 applied, were assumed to be representative of surface water concentrations and were compared against surface water screening values.

There is no evidence of a Site release to the northern detention basin, so this waterbody did not warrant quantitative evaluation in the SLERA. Potential discharges to the southern detention basin were investigated through multiple site visits and the review of historical documentation which found no evidence of discharge from the drainage swale. Soil sampling results indicated that the small eroded channel on the northern shoreline did not contain elevated levels of metals, VOCs, or SVOCs and is not hydrologically connected to the facility. There is also no evidence of a mobile groundwater plume on-Site that would discharge to surface waterbodies or wetlands. The only historic surface water discharge was via the drainage swale which discharged into a wooded area behind the Arch facility. It is possible that once surface water discharged into the wooded area, it could infiltrate into groundwater and be discharged into a downgradient waterbody or wetland. Therefore, groundwater data, with a DAF applied to represent potential surface water concentrations, were evaluated in the SLERA.

As indicated in Table 5, the surface water COPCs included five VOCs and three metals. These COPCs were evaluated relative to the surface water screening values on a sample-by-sample basis in Table 6. This evaluation indicated that concentrations of the organic COPCs and two of the inorganic COPCs were below levels likely to be associated with adverse impacts to aquatic receptors. Only the estimated surface water concentrations of barium were present above the associated ecological screening value. However, the detections of barium were similar to levels detected in other groundwater samples across the Site, suggesting that they are background levels (ENSR, 2004a).

The review of the groundwater detection limits indicated that, although some detection limits for barium, copper, and lead exceeded the associated screening values, and not all detection limits were available for review, the conservative nature of the groundwater evaluation (e.g., no evidence of groundwater plume on-Site and no evidence that groundwater discharges to surface waterbodies) makes it unlikely that risks to surface water receptors are significantly under-estimated.

There is no evidence that a groundwater plume exists on-Site or that it discharges to surface water. The results of the quantitative evaluation of the estimated surface water concentrations against ecological screening values, and the consideration of the detections limits, indicates that Site-related constituents do not appear to be posing a potential for significant risk to aquatic plants. Therefore, no further evaluation of surface water at the Site is warranted.

5.3 Conclusions

The results of the SLERA and the COPC refinement step presented in Appendix E indicate that exposure to Site-related constituents in surface soil and surface water at the Arch facility located at 350 Knotter Drive in Cheshire, Connecticut does not appear to pose a potential for significant risk to terrestrial invertebrates, plants or aquatic receptors. Based on this evaluation no further evaluation of potential ecological risks is warranted as part of the site-wide RCRA Closure process.

6.0 References

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Tables

Table 1
Surface Soil Screening Values

Constituent	Ecological Screening Value	
VOCs (ug/kg)		
2-Butanone	NV	
Acetone	2500	[c]
SVOCs (ug/kg)		
Total HMW PAHs	18000	[a]
Total LMW PAHs	29000	[a]
Total PAHs	18000	[a, d]
Metals (mg/kg)		
Arsenic	18	[a]
Barium	330	[a]
Beryllium	40	[a]
Chromium	0.4	[b]
Copper	70	[a]
Lead	120	[a]
Nickel	38	[a]
Silver	560	[a]
Vanadium	2	[b]
Zinc	120	[a]

[a] - U.S. EPA Ecological Soil Screening Level. Lowest value for plants or soil invertebrates. Available at <http://www.epa.gov/ecotox/ecossl/>.

[b] - U.S. EPA Region 4 soil screening levels (U.S. EPA, 2001).

[c] - U.S. EPA Region 5 Ecological Screening Levels (ESLs) for soil (U.S. EPA, 2003).

[d] - Total HMW PAHs used as a surrogate value.

HMW = High molecular weight.

LMW = Low molecular weight.

mg/kg = milligrams per kilogram, equivalent to parts per million (ppm).

NV = No value identified.

PAH = Polycyclic aromatic hydrocarbons.

SVOCs = Semi-volatile organic compounds, analyzed by EPA Method 8270.

ug/kg= micrograms per kilogram, equivalent to parts per billion (ppb).

VOCs = Volatile organic compounds, analyzed by EPA Method 8260.

Table 2
Surface Water Screening Values

Constituent	Ecological Screening Value	
VOCs (ug/L)		
Acetone	1500	[b]
2-Butanone (MEK)	14000	[b]
Chloroethane	NV	
1,1-Dichloroethane	47	[b]
1,1-Dichloroethene	25	[b]
cis-1,2-Dichloroethene	590 DCE	[b]
1,1,1-Trichloroethane	11	[b]
Toluene	9.8	[b]
Ethylbenzene	7.3	[b]
Total Xylenes	13	[b]
Isopropylbenzene	255	[c]
1,3,5-Trimethylbenzene	71	[c]
1,2,4-Trimethylbenzene	77	[c]
4-Isopropyltoluene	85	[c]
Chloroform	28	[b]
Bromodichloromethane	4320	[c]
Dichlorodifluoromethane	1960	[c]
Trichlorofluoromethane	1740	[c]
Metals (mg/L)		
Barium	0.004	[b]
Cadmium	0.00135	[a]
Chromium	0.042	[a]
Copper	0.0048	[a]
Lead	0.0012	[a]
Nickel	0.0289	[a]
Zinc	0.065	[a]

[a] - Connecticut Water Quality Standard (CTDEP, 2002).

[b] - Secondary Chronic Value (Suter and Tsao, 1996).

[c] - U.S.EPA Region 6 recommended value from Texas Natural Resource Conservation Commission (2001).

mg/L = milligrams per liter, equivalent to parts per million (ppm)

NV = No value identified.

ug/L = micrograms per liter, equivalent to parts per billion (ppb)

VOCs = Volatile organic compounds, analyzed by EPA Method 8260B.

Table 3
Identification of Surface Soil COPCs

Constituent	Maximum Detected Concentration	Ecological Screening Value ¹	Retained as COPC? ²
VOCs (ug/kg)			
2-Butanone	90	NV	YES
Acetone	63	2500	NO
SVOCs (ug/kg)			
Total HMW PAHs	2541	18000	NO
Total LMW PAHs	160	29000	NO
Total PAHs	2701	18000	NO
Metals (mg/kg)			
Arsenic	6.2	18	NO
Barium	170	330	NO
Beryllium	1	40	NO
Chromium	19	0.4	YES
Copper	53	70	NO
Lead	22	120	NO
Nickel	12	38	NO
Silver	0.62	560	NO
Vanadium	28	2	YES
Zinc	110	120	NO

1 = Ecological screening values for surface soil presented in Table 1.

2 = Constituent retained as constituent of potential concern (COPC) if maximum surface soil concentration exceeds ecological screening value.

HMW = High molecular weight.

LMW = Low molecular weight.

mg/kg = milligrams per kilogram, equivalent to parts per million (ppm).

NV = No value identified.

PAH = Polycyclic aromatic hydrocarbons.

SVOCs = Semi-volatile organic compounds, analyzed by EPA Method 8270.

ug/kg= micrograms per kilogram, equivalent to parts per billion (ppb).

VOCs = Volatile organic compounds, analyzed by EPA Method 8260.

Table 4
Sample-by-Sample Evaluation of
Surface Soil COPCs

COPCs	Ecological Screening Value	Site Locations																					
		SS-01	HQ	SS-02	HQ	SS-03	HQ	SS-04	HQ	SS-05	HQ	SS-06	HQ	SS-07	HQ	SS-08	HQ	SS-09	HQ	SS-10 [b]	HQ	SS-11	HQ
VOCs (ug/kg)																							
2-Butanone	NV	13 U		12 U		14 U		13 U		90 J		11 U		11 U		13 U		12 U		12 U		10 U	
Metals (mg/kg)																							
Chromium	0.4 [a]	12 J-	30	17 J-	42.5	7.8 J-	19.5	8.3 J-	20.75	19 J-	47.5	12 J-	30	13 J-	32.5	13 J-	32.5	9.5 J-	23.75	12 J-	30	12 J-	30
Vanadium	2 [a]	22	11	28	14	12	6	16	8	26	13	22	11	21	10.5	17	8.5	20	10	22	11	24	12

Shading indicates instances where detected soil concentration exceeds the ecological screening value (HQ>1).

[a] - U.S. EPA Region 4 soil screening levels (U.S. EPA, 2001).

[b] - Average of parent and field duplicate.

HQ = Hazard quotient. Detected concentration/ecological screening value.

J = Estimated value, biased low.

mg/kg = milligrams per kilogram, equivalent to parts per million (ppm).

NV = No value identified.

U = Not detected at specified detection limit.

ug/kg = micrograms per kilogram, equivalent to parts per billion (ppb).

VOCs = Volatile organic compounds, analyzed by EPA Method 8260.

Table 5
Identification of Surface Water COPCs

Constituents	Maximum Detected Concentration in Groundwater	Estimated Maximum Detected Concentration in Surface Water ¹	Ecological Screening Value ²	Retained as COPC? ³
VOCs (ug/L)				
Acetone	39	3.9	1500	NO
2-Butanone (MEK)	22	2.2	14000	NO
Chloroethane	5	0.5	NV	YES
1,1-Dichloroethane	320	32	47	NO
1,1-Dichloroethene	2.1	0.21	25	NO
cis-1,2-Dichloroethene	36	3.6	590 DCE	NO
1,1,1-Trichloroethane	4.9	0.49	11	NO
Toluene	2000	200	9.8	YES
Ethylbenzene	320	32	7.3	YES
Total Xylenes	880	88	13	YES
Isopropylbenzene	2	0.2	255	NO
1,3,5-Trimethylbenzene	1.7	0.17	71	NO
1,2,4-Trimethylbenzene	3	0.3	77	NO
4-Isopropyltoluene	5.7	0.57	85	NO
Chloroform	400	40	28	YES
Bromodichloromethane	1.2	0.12	4320	NO
Dichlorodifluoromethane	16	1.6	1960	NO
Trichlorofluoromethane	20	2	1740	NO
Metals (mg/L)				
Barium	0.6760	0.0676	0.004	YES
Cadmium	0.0240	0.0024	0.00135	YES
Chromium	0.0048	0.00048	0.042	NO
Copper	0.0138	0.00138	0.0048	NO
Lead	0.0140	0.0014	0.0012	YES
Nickel	0.0075	0.00075	0.0289	NO
Zinc	0.0323	0.00323	0.065	NO

1 = Surface water concentration estimated by applying dilution attenuation factor of 10 to groundwater concentration.

2 = Ecological screening values for surface water presented in Table 2.

3 = Constituent retained as constituent of potential concern (COPC) if estimated maximum surface water concentration exceeds ecological screening value.

mg/L = milligrams per liter, equivalent to parts per million (ppm)

NV = No value identified.

ug/L = micrograms per liter, equivalent to parts per billion (ppb)

VOCs = Volatile organic compounds, analyzed by EPA Method 8260B.

Table 6
Sample-by-Sample Evaluation of
Surface Water COPCs

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		GZ-1		GZ-2		GZ-3		GZ-4		GZ-5		GZ-6		GZ-7		GZ-8		GZ-9		GZ-10		GZ-11		MW-1		MW-2		MW-3	
COPC	Ecological Screening Value	10/28/1999	HQ	10/28/1999	HQ	2/7/2002	HQ	10/28/1999	HQ	10/28/1999	HQ	12/16/1999	HQ	2/7/2002	HQ	12/16/1999	HQ	2/7/2002	HQ	2/7/2002	HQ	2/7/2002	HQ	2/7/2002	HQ	2/7/2002	HQ	2/7/2002	HQ
VOCs (ug/L)																													
Chloroethane	NV	0.5	U	0.5	U	0.22		0.5	U	0.5	U	0.5	U	0.2	U	0.5	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Toluene	9.8 [b]	0.1	U	0.1	U	0.4	0.041	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.42	0.043
Ethylbenzene	7.3 [b]	0.1	U	0.1	U	1.5	0.21	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Total Xylenes	13 [b]	0.1	U	0.1	U	0.2	U	0.1	U	0.1	U	0.1	U	0.2	U	0.1	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Chloroform	28 [b]	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Metals (mg/L)																													
Barium	0.0040 [b]	0.005	U	0.005	U	0.0040	1.0	0.0058	1.5	0.005	U	0.005	U	0.00912	2.3	0.005	U	0.00186	0.47	0.0676	16.9	0.0274	6.9	0.0041	1.0	0.0062	1.6	0.0259	6.5
Cadmium	0.00135 [a]	0.0005	U	0.0005	U	0.000125	U	0.0005	U	0.0005	U	0.0005	U	0.001350	1.0	0.0005	U	0.000125	U	0.000125	U	0.000125	U	0.000125	U	0.000125	U	0.000125	U
Lead	0.0012 [a]	0.0013	U	0.0013	U	0.000375	U	0.0013	U	0.0013	U	0.000375	U	0.0013	U	0.000375	U	0.0013	U	0.000375	U	0.000375	U	0.000375	U	0.000375	U	0.000375	U

Constituent retained as constituent of potential concern (COPC) if estimated surface water concentration exceeded ecological screening value.
Concentrations represent estimated surface water concentrations derived by applying dilution attenuation factor of 10 to most recent groundwater concentration in each monitoring well.
Shading indicates instances where estimated surface water concentration exceeds the ecological screening value (HQ>1).

[a] - Connecticut Water Quality Standard (CTDEP, 2002).
[b] - Secondary Chronic Value (Suter and Tsao, 1996).

HQ = Hazard quotient. Detected concentration/ecological screening value.
mg/L = milligrams per liter, equivalent to parts per million (ppm)
NV = No value identified.
U = Not Detected
ug/L = micrograms per liter, equivalent to parts per billion (ppb)
VOCs = Volatile organic compounds, analyzed by EPA Method 8260B.

Table 7
Evaluation of Surface Soil Detection Limits

Constituents	Range of Non-Detects		Ecological Screening Value	Retained as COPC?
	Minimum Detection Limit	Maximum Detection Limit		
VOCs (ug/kg)				
1,1,1,2-Tetrachloroethane	1	1.4	225000 [c]	NO
1,1,1-Trichloroethane	1	1.4	29800 [c]	NO
1,1,2,2-Tetrachloroethane	1	1.4	127 [c]	NO
1,1,2-Trichloro-1,2,2-trifluoroethane	4.1	5.5	NV	NO
1,1,2-Trichloroethane	1.5	2.1	28600 [c]	NO
1,1-Dichloroethane	1.5	2.1	20100 [c]	NO
1,1-Dichloroethene	1	1.4	8280 [c]	NO
1,1-Dichloropropene	5.1	6.9	NV	NO
1,2,3-Trichlorobenzene	5.1	6.9	NV	NO
1,2,3-Trichloropropene	10	14	3360 [c]	NO
1,2,4-Trichlorobenzene	5.1	6.9	11100 [c]	NO
1,2,4-Trimethylbenzene	5.1	6.9	NV	NO
1,2-Dibromo-3-chloropropane	5.1	6.9	35.2 [c]	NO
1,2-Dibromoethane	4.1	5.5	1230 [c]	NO
1,2-Dichlorobenzene	5.1	6.9	2960 [c]	NO
1,2-Dichloroethane	1	1.4	400 [b]	NO
1,2-Dichloropropane	3.6	4.8	700000 [b]	NO
1,3,5-Trimethylbenzene	5.1	6.9	NV	NO
1,3-Dichlorobenzene	5.1	6.9	37700 [c]	NO
1,3-Dichloropropane	5.1	6.9	NV	NO
1,4-Dichlorobenzene	5.1	6.9	546 [c]	NO
2,2-Dichloropropane	5.1	6.9	NV	NO
2-Chlorotoluene	5.1	6.9	NV	NO
2-Hexanone	10	14	12600 [c]	NO
4-Chlorotoluene	5.1	6.9	NV	NO
4-Methyl-2-pentanone	10	14	443000 [c]	NO
Acrylonitrile	4.1	5.5	23.9 [c]	NO
Benzene	1	1.4	50 [b]	NO
Bromobenzene	5.1	6.9	NV	NO
Bromodichloromethane	1	1.4	540 [c]	NO
Bromoform	4.1	5.5	15900 [c]	NO
Bromomethane	2	2.7	235 [c]	NO
Carbon Disulfide	51	69	94.1 [c]	NO
Carbon Tetrachloride	1	1.4	1000000 [b]	NO
Chlorobenzene	1	1.4	50 [b]	NO
Chloroethane	2	2.7	NV	NO
Chloroform	1.5	2.1	1190 [c]	NO
Chloromethane	5.1	6.9	10400 [c]	NO
cis-1,2-Dichloroethylene	1	1.4	NV	NO
cis-1,3-Dichloropropene	1	1.4	398 [c]	NO
Dibromochloromethane	1	1.4	NV	NO
Dibromomethane	10	14	NV	NO
Dichlorodifluoromethane	10	14	39500 [c]	NO
Ethylbenzene	1	1.4	50 [b]	NO
Hexachlorobutadiene	5.1	6.9	39.8 [c]	NO
Isopropylbenzene	1	1.4	NV	NO
Methyl tert-butyl ether (MTBE)	2	2.7	NV	NO
Methylene Chloride	10	14	4050 [c]	NO
Naphthalene	5.1	6.9	100 [b]	NO
N-Butylbenzene	1	1.4	NV	NO
N-Propylbenzene	1	1.4	NV	NO
O-Xylene	2	2.7	50 [b]	NO
P/M-Xylene	2	2.7	50 [b]	NO
P-Isopropyltoluene	1	1.4	NV	NO
Sec-Butylbenzene	1	1.4	NV	NO
Styrene	2	2.7	100 [b]	NO
Tert-Butylbenzene	5.1	6.9	NV	NO
Tetrachloroethylene	1	1.4	10 [b]	NO
Tetrahydrofuran	20	27	100 [b]	NO
Toluene	1.5	2.1	50 [b]	NO
trans-1,2-Dichloroethene	1.5	2.1	784 [c]	NO
trans-1,3-Dichloropropene	1	1.4	398 [c]	NO
Trans-1,4-Dichlorobutene	5.1	6.9	NV	NO
Trichloroethene	1	1.4	12400 [c]	NO
Trichlorofluoromethane	5.1	6.9	16400 [c]	NO
Vinyl Chloride	2	2.7	10 [b]	NO

Table 7
Evaluation of Surface Soil Detection Limits

Constituents	Range of Non-Detects		Ecological Screening Value	Retained as COPC?
	Minimum Detection Limit	Maximum Detection Limit		
SVOCs (ug/kg)				
1,2,4,5-Tetrachlorobenzene	1500	1800	2020 [c]	NO
1,2,4-Trichlorobenzene	370	460	11100 [c]	NO
2,2'-oxybis(1-Chloropropane)	370	460	NV	NO
2,4,5-Trichlorophenol	370	460	4000 [b]	NO
2,4,6-Trichlorophenol	370	460	10000 [b]	NO
2,4-Dichlorophenol	740	930	87500 [c]	NO
2,4-Dimethylphenol	370	460	10 [c]	YES
2,4-Dinitrophenol	1500	1800	20000 [b]	NO
2,4-Dinitrotoluene	370	460	1280 [c]	NO
2,6-Dinitrotoluene	370	460	32.8 [c]	YES
2-Chloronaphthalene	15	33	12.2 [c]	YES
2-Chlorophenol	440	560	243 [c]	YES
2-Methylnaphthalene	15	33	3240 [c]	NO
2-Methylphenol	440	560	40400 [c]	NO
2-Nitroaniline	370	460	74100 [c]	NO
2-Nitrophenol	1500	1800	1600 [c]	YES
3,3'-Dichlorobenzidine	740	930	646 [c]	YES
3-Methylphenol/4-Methylphenol	440	560	3490 [c]	NO
3-Nitroaniline	370	460	3160 [c]	NO
4,6-Dinitro-2-methylphenol	1500	1800	144 [c]	YES
4-Bromophenyl phenylether	370	460	NV	NO
4-Chloro-3-methylphenol	370	460	NV	NO
4-Chloroaniline	370	460	1100 [c]	NO
4-Chlorophenyl phenylether	370	460	NV	NO
4-Nitroaniline	520	650	21900 [c]	NO
4-Nitrophenol	740	930	7000 [b]	NO
Acenaphthene	15	33	20000 [b]	NO
Acenaphthylene	15	33	682000 [c]	NO
Aniline	740	930	56.8 [c]	YES
Anthracene	15	33	100 [b]	NO
bis(2-chloroethoxy)methane	370	460	302 [c]	YES
bis(2-Chloroethyl)ether	370	460	23700 [c]	NO
bis(2-Ethylhexyl)phthalate	740	930	925 [c]	YES
Butylbenzylphthalate	370	460	239 [c]	YES
Carbazole	370	460	NV	NO
Dibenzofuran	370	460	NV	NO
Diethylphthalate	370	460	100000 [b]	NO
Dimethylphthalate	370	460	200000 [b]	NO
Di-n-butylphthalate	370	460	200000 [b]	NO
Di-n-octylphthalate	370	460	709000 [c]	NO
Fluorene	15	33	30000 [b]	NO
Hexachlorobenzene	370	460	199 [c]	YES
Hexachlorobutadiene	740	930	39.8 [c]	YES
Hexachlorocyclopentadiene	740	930	755 [c]	YES
Hexachloroethane	370	460	596 [c]	NO
Isophorone	370	460	139000 [c]	NO
Naphthalene	15	33	100 [b]	NO
Nitrobenzene	370	460	40000 [b]	NO
N-Nitroso-di-n-propylamine	370	460	544 [c]	NO
N-Nitrosodiphenylamine	1100	1400	20000 [b]	NO
Pentachloronitrobenzene	740	930	7090 [c]	NO
Pentachlorophenol	60	130	2 [b]	YES
Phenol	520	650	50 [b]	YES
Pyridine	3700	4600	100 [b]	YES
Metals (mg/kg)				
Antimony	2.2	2.7	78 [a]	NO
Cadmium	0.44	0.54	32 [a]	NO
Mercury	0.090	0.11	0.10 [b]	YES
Selenium	0.89	1.1	0.52 [a]	YES
Thallium	0.89	2.1	1.0 [b]	YES

Concentrations represent range of surface soil detection limits for constituents that were not detected in 2009 sampling program.
Shading indicates instances where soil detection limit exceeds the ecological screening value.

[a] - U.S. EPA Ecological Soil Screening Level. Lowest value for plants or soil invertebrates. Available at <http://www.epa.gov/ecotox/ecoss/>.

[b] - U.S. EPA Region 4 soil screening levels (U.S. EPA, 2001)

[c] - U.S. EPA Region 5 Ecological Screening Levels (ESLs) for soil (U.S. EPA, 2003).

COPC = Constituent of Potential Concern.

mg/kg = milligrams per kilogram, equivalent to parts per million (ppm).

NV = No value identified.

SVOCs = Semi-volatile organic compounds, analyzed by EPA Method 8270.

ug/kg= micrograms per kilogram, equivalent to parts per billion (ppb).

VOCs = Volatile organic compounds, analyzed by EPA Method 8260.

Table 8
Evaluation of Estimated Surface Water Detection Limits

Constituents	Range of Non-Detects		Ecological Screening Value	Retained as COPC?
	Estimated Minimum Detection Limit for Surface Water	Estimated Maximum Detection Limit for Surface Water		
VOCs (ug/L)				
Acetone	0.1	50	1500 [b]	NO
2-Butanone (MEK)	0.1	25	14000 [b]	NO
Chloroethane	0.2	1	NV	NO
1,1-Dichloroethane	0.1	0.1	47 [b]	NO
1,1-Dichloroethene	0.1	0.5	25 [b]	NO
cis-1,2-Dichloroethene	0.1	0.1	590 [b,d]	NO
1,1,1-Trichloroethane	0.1	0.5	11 [b]	NO
Toluene	0.1	0.2	9.8 [b]	NO
Ethylbenzene	0.1	0.1	7.3 [b]	NO
Total Xylenes	0.1	0.2	13 [b]	NO
Isopropylbenzene	0.1	0.5	255 [c]	NO
1,3,5-Trimethylbenzene	0.1	0.5	71 [c]	NO
1,2,4-Trimethylbenzene	0.1	0.5	77 [c]	NO
4-Isopropyltoluene	0.1	0.5	85 [c]	NO
Chloroform	0.1	0.5	28 [b]	NO
Bromodichloromethane	0.1	0.5	4320 [c]	NO
Dichlorodifluoromethane	0.1	1	1960 [c]	NO
Trichlorofluoromethane	0.1	2.5	1740 [c]	NO
Metals (mg/L)				
Barium	0.001	0.005	0.004 [b]	YES
Cadmium	0.000125	0.0005	0.00135 [a]	NO
Chromium	0.00025	0.005	0.042 [a]	NO
Copper	0.00025	0.005	0.0048 [a]	YES
Lead	0.000375	0.0013	0.0012 [a]	YES
Nickel	0.00025	0.005	0.0289 [a]	NO
Zinc	0.00025	0.001	0.065 [a]	NO

Concentrations represent range of groundwater detection limits for constituents detected at least once in the groundwater sampling program. Shading indicates instances where estimated surface water detection limit exceeds the ecological screening value (i.e., assumes dilution attenuation factor of 10 applied to groundwater detection limit for screening comparison).

[a] - Connecticut Water Quality Standard (CTDEP, 2002).

[b] - Secondary Chronic Value (Suter and Tsao, 1996).

[c] - U.S.EPA Region 6 recommended value from Texas Natural Resource Conservation Commission (2001).

[d] - Value for 1,2-Dichloroethene

COPC = Constituent of Potential Concern.

mg/L = milligrams per liter, equivalent to parts per million (ppm)

NV = No value identified.

ug/L = micrograms per liter, equivalent to parts per billion (ppb)

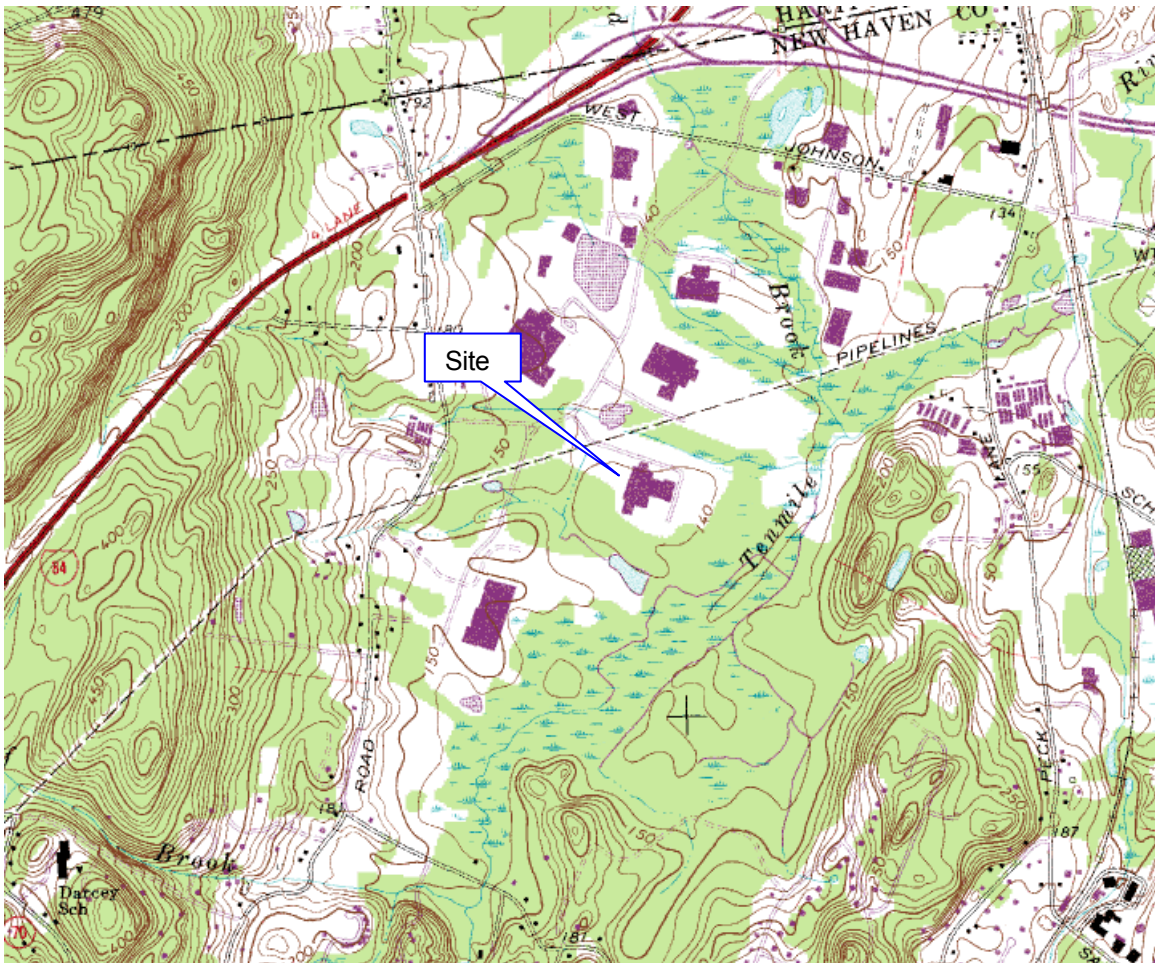
NS = Not Sampled

ND = Not Detected

U = Not Detected

VOCs = Volatile organic compounds, analyzed by EPA Method 8260B.

Figures

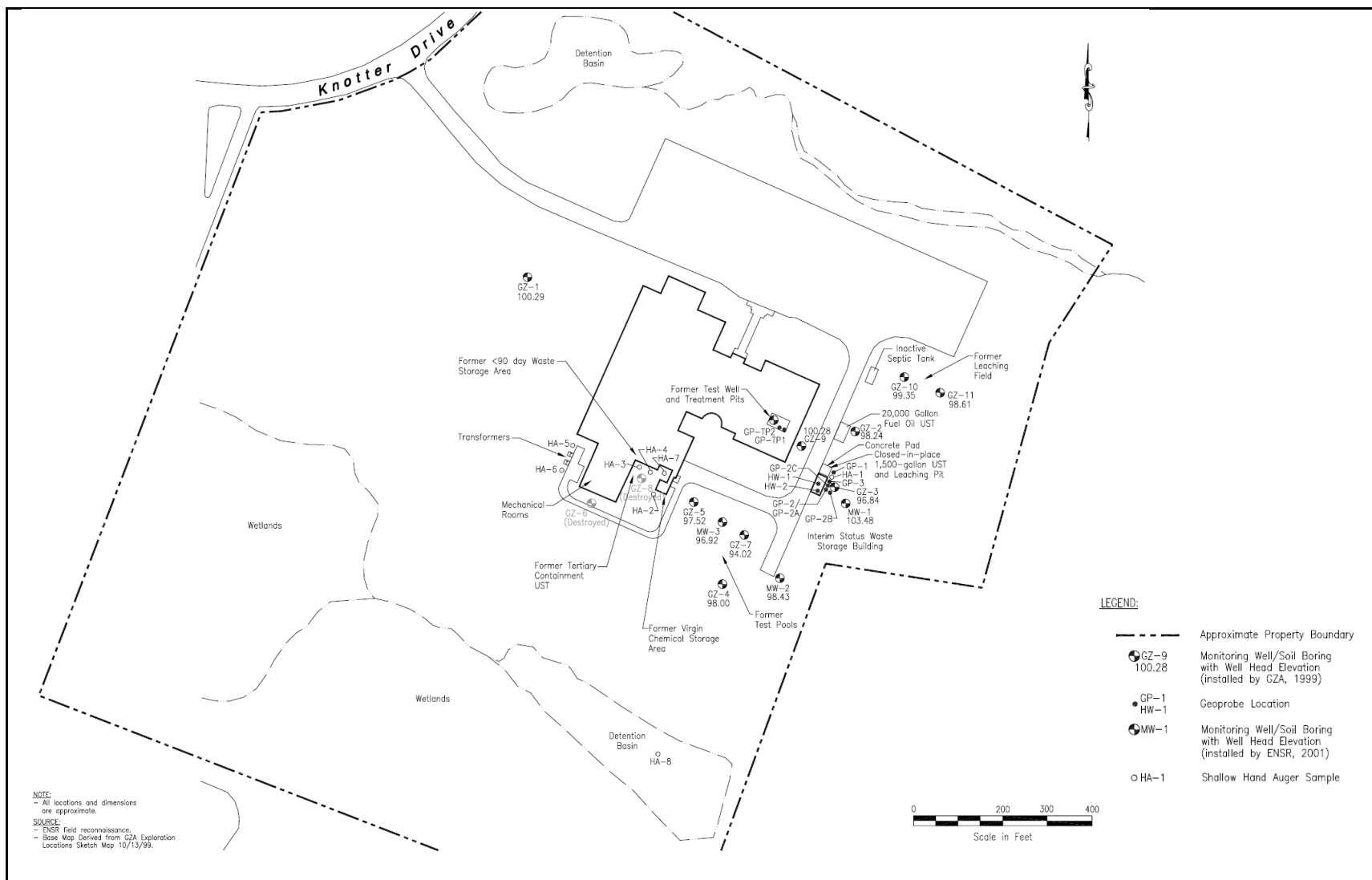


AECOM

Arch Chemical, Inc.
350 Knotter Drive
Cheshire, Connecticut

Site Locus

Figure 1



AECOM

Arch Chemical, Inc.
350 Knotter Drive
Cheshire, Connecticut

Site Plan

Figure 2

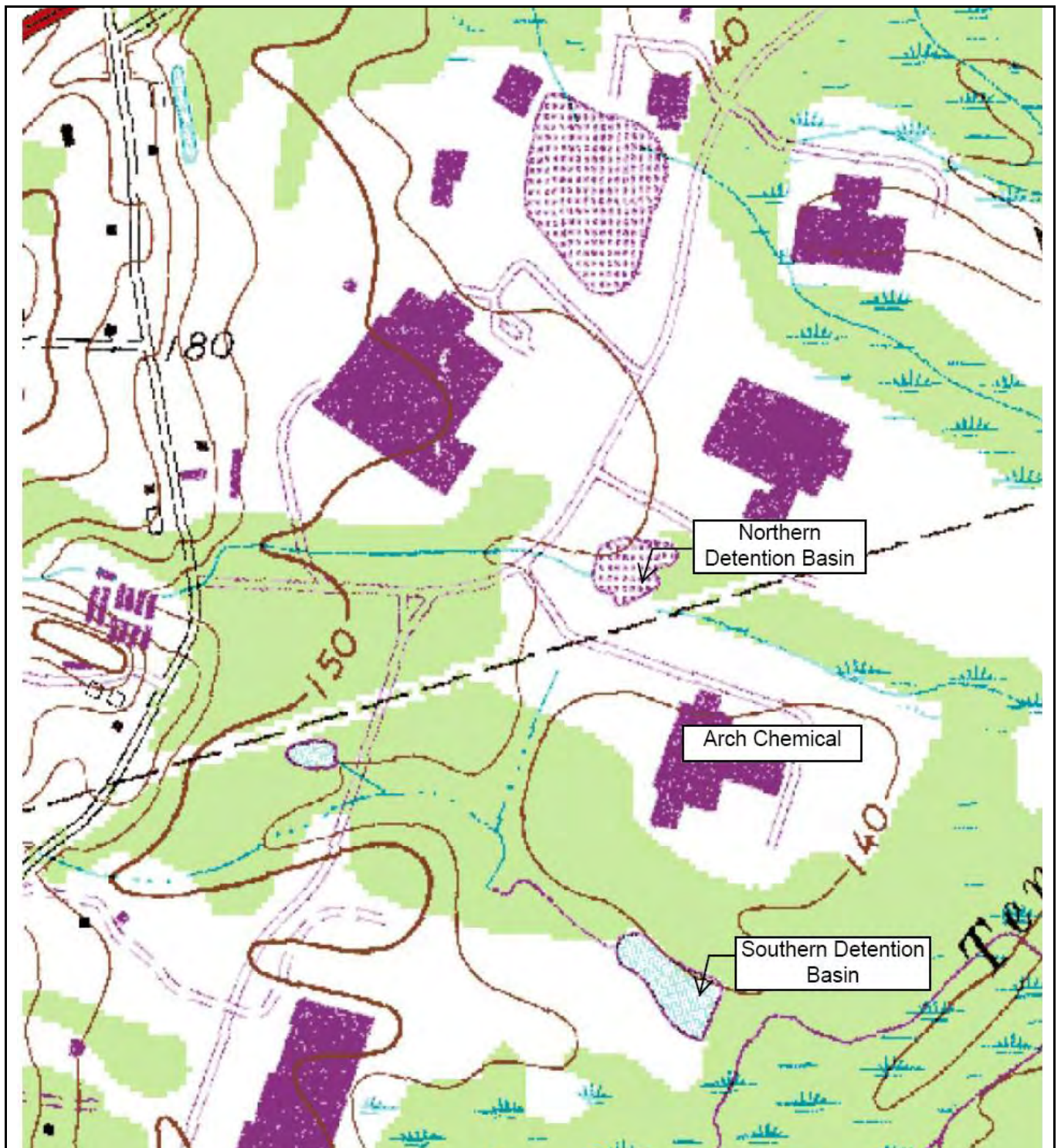


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Arch Chemical, Inc.
350 Knotter Drive
Cheshire, Connecticut

Local Land Use Map

Figure 3



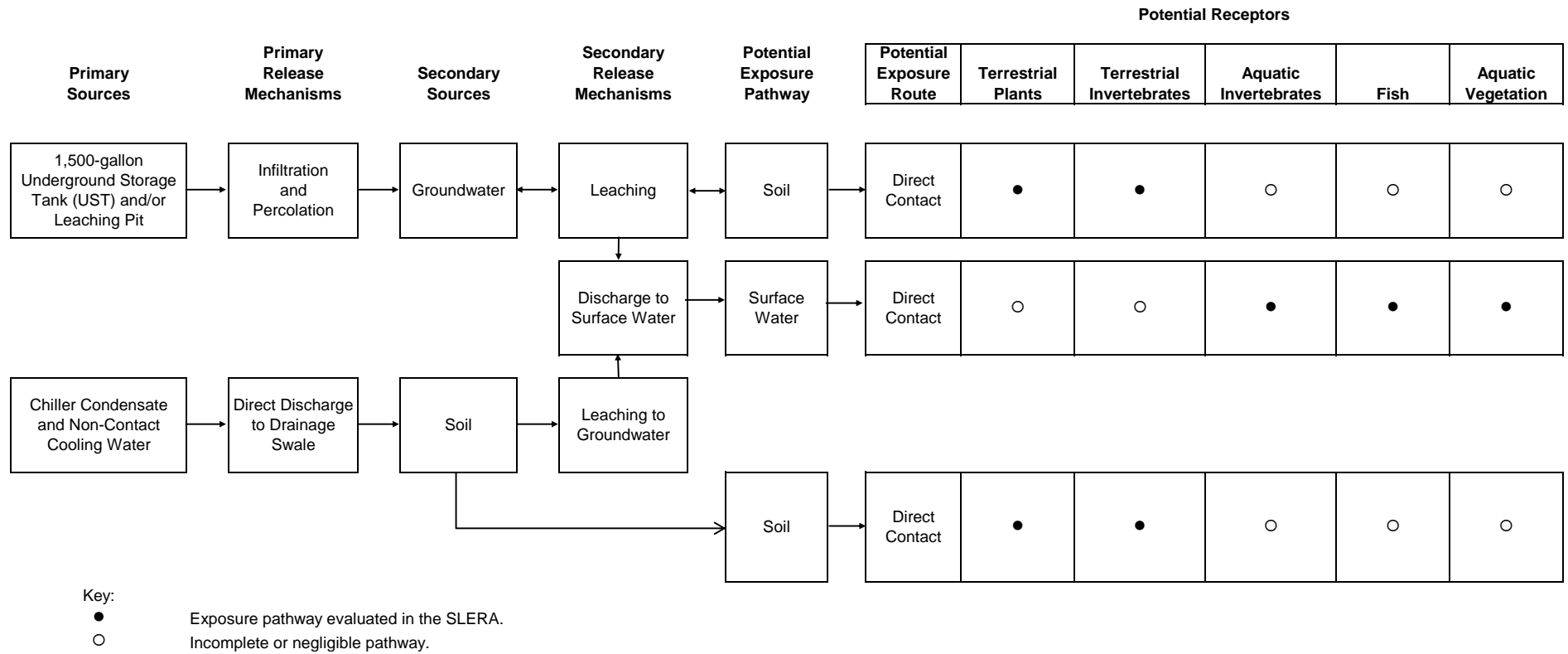
AECOM

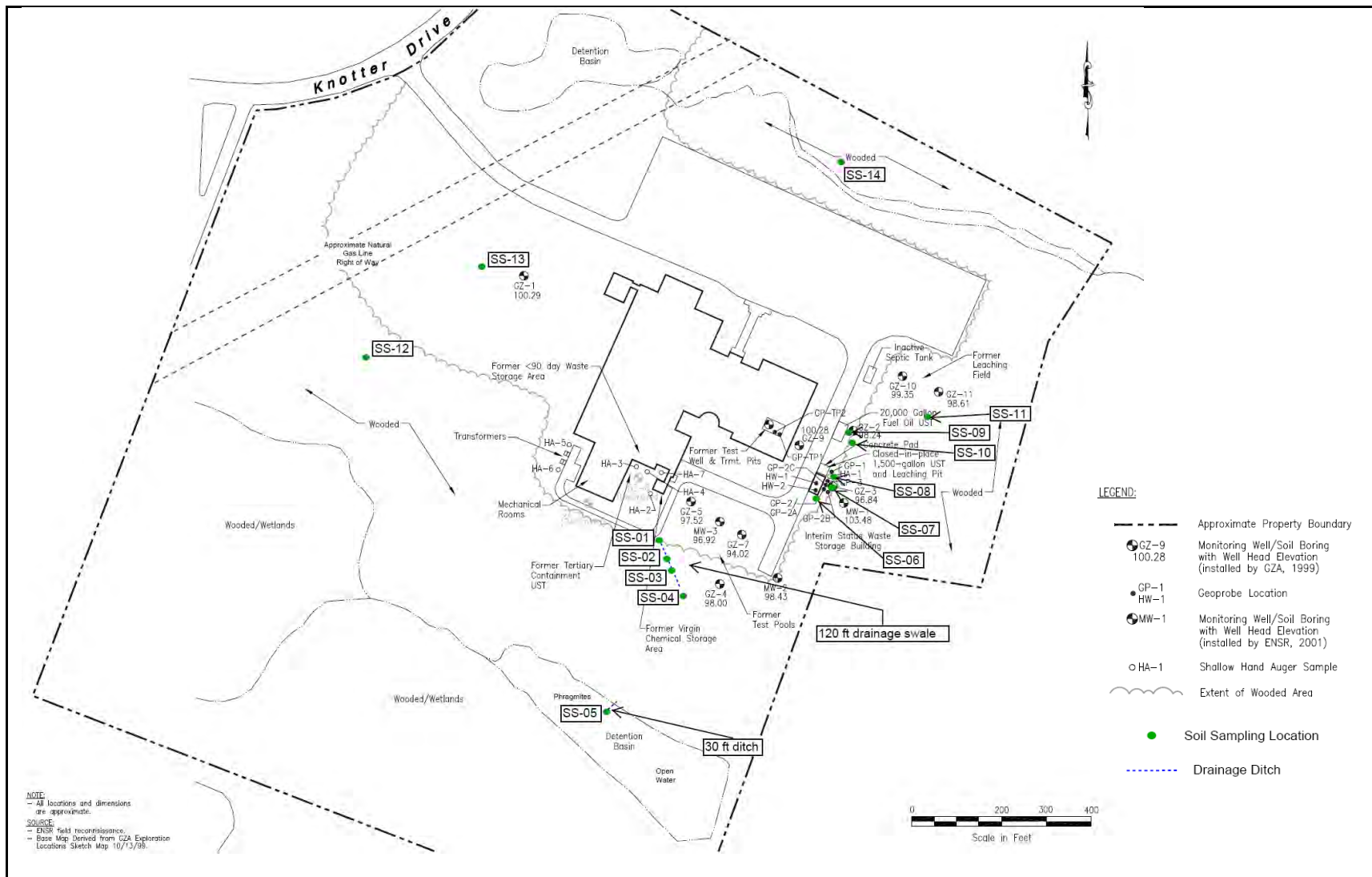
Arch Chemical, Inc.
350 Knotter Drive
Cheshire, Connecticut

Drainage and Topographic
Map

Figure 4

Figure 5
Ecological Conceptual Site Model





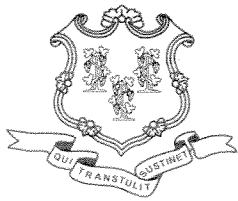
Arch Chemical, Inc.
 350 Knottter Drive
 Cheshire, Connecticut

Surface Soil and Groundwater Sampling Locations

Figure 6

Appendix A

Responses from the Connecticut Natural Diversity Data Base



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Natural Resources
Division of Wildlife
79 Elm Street, 6th Floor
Hartford, CT 06106
Natural Diversity Data Base

May 4, 2007

Ms. Christine Archer
ENSR, Inc.
2 Technology Park Drive
Westford, MA 01886

re: RCRA Site Closure Activities at Arch
Chemicals at 350 Knotter Drive in
Cheshire, Connecticut

Dear Ms. Archer:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed RCRA closure activities associated with Arch Chemicals at 350 Knotter Drive in Cheshire, Connecticut. According to our information, there are records for State Special Concern *Terrapene carolina carolina* (eastern box turtle), *Glyptemys insculpta* (wood turtle), *Thamnophis sauritus* (eastern ribbon snake) and *Heterodon platirhinos* (hognose snake) from the vicinity of this project site. I have sent your letter to Julie Victoria (DEP-Wildlife; 860-642-7239) for further review. She will write to you directly with her comments.

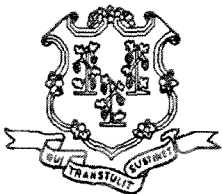
Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Environmental Protection's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at 424-3592. Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Sincerely,

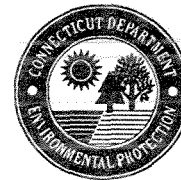

Dawn M. McKay
Biologist/Environmental Analyst

Cc: Julie Victoria, NDDB # 15218



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRANKLIN WILDLIFE MANAGEMENT AREA

391 ROUTE 32
NORTH FRANKLIN, CT 06254
TELEPHONE: (860) 642-7239



May 11, 2007

Ms. Christine Archer
ENSR, Inc.
2 Technology Park Drive
Westford, MA 01886

re: RCRA Site Closure Activities at Arch Chemicals, 350 Knotter Drive, Cheshire, CT

Dear Ms. Archer:

Your request was forwarded to me your request was forwarded to me on 5/10/07 from Dawn McKay of the of the Department of Environmental Protection's (DEP) Natural Diversity Data Base. Their records indicate that four Species of Special Concern, Eastern Box Turtle (*Terrapene carolina*), Wood Turtle (*Glyptemys insculpta*) Eastern hognose (*Heterodon platyrhinos*) and Eastern ribbon snake (*Thamnophis sauritus*) occur in the vicinity of your project.

Eastern box turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds, the adults are completely terrestrial but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year.

Wood turtles require riparian habitats bordered by flood plains, woodlands or meadows. Their summer habitat includes pastures, old fields, woodlands, power line cuts and railroad beds bordering or adjacent to streams and rivers. They hibernate submerged in tangled tree roots along the river banks or in deep pools from November 1 to April 1.

Eastern hognose snakes favor dry sandy areas with well drained gravelly soils. They have been negatively impacted by the loss of suitable habitat. Time of year that the work will be done can also negatively impact these species. The Wildlife Division recommends that work be done during the snakes dormant period, November 1 to April 1.

Eastern ribbon snakes inhabit areas with shallow water, grassy or shrubby areas bordering streams and wooded swamps. They also prefer sunny areas with low dense vegetation near shallow water areas. Their diet consists of insects, fish, frogs, salamanders and toads. This species has recently been negatively impacted by the loss of suitable habitat.

If you are planning to conduct work in or impact any of these species habitat, the Wildlife Division recommends that a herpetologist familiar with the habitat requirements of these species conduct surveys. A report summarizing the results of such surveys should include habitat descriptions, reptile species list and a statement/resume giving the herpetologist's qualifications. The DEP doesn't maintain a list of qualified herpetologists. A DEP Wildlife Division permit may be required by the herpetologist to conduct survey work, you should ask if your herpetologist has one. The results of this investigation can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

The Wildlife Division has not been provided with details or a timetable of the work to be done. Consultation with the Wildlife Division should not be substituted for site-specific surveys that may be required for environmental assessments. Please be advised that should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested. If you have any additional questions, please feel free to contact me at Julie.Victoria@po.state.ct.us during the field season (April – August), please reference the NDDB # at the bottom of this letter when you e-mail. Thank you for the opportunity to comment.

Sincerely,

Julie Victoria
Wildlife Biologist
Franklin Swamp Wildlife Management Area
391 Route 32
N. Franklin, CT 06254

Appendix B

Data Quality Review of Surface Soil Data

AECOM Environment

2 Technology Park Drive, Westford, Massachusetts 01886

T 978.589.3000 F 978.589.3100 www.aecom.com

Memorandum

Date: December 3, 2009

To: Christine Archer

From: Lori Herberich

Subject: Reasonable Confidence Review and Data Quality Assessment
Arch Chemicals, Inc.
Alpha Analytical Lab Number L0916093

File 60135922-500

Arch_ZZ419_L0916093.docx

A Reasonable Confidence review and data quality assessment were performed on the data for the samples collected on November 9, 2009 at the Arch Chemicals, Inc. facility located on Knotter Drive in Cheshire, Connecticut. The samples were submitted to Alpha Analytical in Westborough, MA for analysis. The samples were reported under Lab Number L0916093.

This review was performed in accordance with the project-specific Quality Assurance Project Plan and with reference to the Connecticut Department of Environmental Protection (CTDEP) document *Laboratory Quality Assurance and Quality Control Guidance, Reasonable Confidence Protocols Guidance Document*, November 2007; CTDEP *Laboratory Quality Assurance and Quality Control, Data Quality Assessment and Data Usability Evaluation Guidance Document*, May 2009; and the applicable recommended Reasonable Confidence Protocols (RCPs).

The data have met the reasonable confidence requirements. EPA Region I Data Validation Guidelines were used for assessing data usability. If data qualifiers were required, potential direction of associated bias was indicated where possible (J+ for high bias/J- for low bias). Refer to Table I (attached) for qualified data.

Data for the following samples was assessed:

Sample	Analysis
SS-01-110909-1	VOCs, SVOCs, Metals
SS-02-110909-1	
SS-03-110909-1	
SS-04-110909-1	
SS-05-110909-1	
SS-06-110909-1	
SS-07-110909-1	
SS-08-110909-1	
SS-09-110909-1	
SS-10-110909-1	
SS-11-110909-1	
SS-12-110909-1	

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Sample	Analysis
SS-13-110909-1	VOCs, SVOCs, Metals
SS-14-110909-1	
EB-110909-3	
SS-10-110909-2	
EB-110909-3A	
Trip Blank	VOCs

VOCs – Volatile Organic Compounds

SVOCs – Semivolatile Organic Compounds (see QAPP for compounds by selected ion monitoring)

The following criteria were assessed.

Sample Collection

Element	Comment
Holding Times	All criteria were met.
Container	All criteria were met.
Preservation	All criteria were met.

Sample Analysis

Element	Comment
Target Analytes	All criteria were met.
Reporting Limits	<p>In general, the Reporting Limits (RLs) in the QAPP were met by the laboratory. Sample-specific preparation factors and moisture content resulted in RLs greater than those listed in the QAPP.</p> <p>The RL of 10 ug/kg listed in the QAPP for carbon disulfide was not met; however, the sample-specific RLs for this compound were less than the Ecological Soil Screening Level of 94.1 ug/Kg.</p>
Laboratory QC (required reporting elements for each method and others narrated)	<p>Factors affecting precision:</p> <p>The relative percent differences (RPDs) for the following SVOCs exceeded the acceptance criteria for the Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) analyses associated with all soil samples: 2,4-dinitrophenol, hexachlorocyclopentadiene, and 4,6-dinitro-2-methylphenol. Positive and nondetect results for these compounds in the soil samples are qualified as estimated (J/UJ).</p> <p>The RPDs for the following SVOCs exceeded the acceptance criteria for the LCS/LCSD analyses associated with samples EB-110909-3 and EB-</p>

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Element	Comment
	<p>110909-3A: 2,4-dimethylphenol and pyridine. Positive and nondetect results for these compounds in samples EB-110909-3 and EB-110909-3A are qualified as estimated (J/UJ).</p> <p>Factors affecting accuracy:</p> <p>The percent recoveries for several VOCs exceeded the acceptance criteria in the LCS/LCSD analyses associated with samples EB-110909-3 and EB-110909-3A. Qualification of the data was not required since those compounds were not detected in the samples.</p> <p>The percent recoveries for the following SVOCs fell below the acceptance criteria for the LCS and/or LCSD analyses associated with the soil samples: aniline, 2,4-dinitrophenol, and hexachlorocyclopentadiene. Positive and nondetect results for these compounds in the soil samples are qualified as estimated (J-/UJ).</p> <p>The percent recoveries for the following SVOCs fell below the acceptance criteria for the LCS and/or LCSD analyses associated with samples EB-110909-3 and EB-110909-3A: 1,2,4-trichlorobenzene, hexachlorobutadiene, hexachloroethane, aniline, 4-chloroaniline, phenol, and pyridine. Positive and nondetect results for these compounds in samples EB-110909-3 and EB-110909-3A are qualified as estimated (J-/UJ).</p> <p>The percent recovery for copper exceeded the acceptance criteria for the LCS associated with the soil samples. Positive copper results are qualified as estimated (J+) and nondetects are accepted unqualified.</p>
Sample QC (required reporting elements for each method and others narrated)	<p>Factors affecting precision: The RPD for the SVOC 3,3-dichlorobenzidine exceeded the acceptance criteria for the MS/MSD analyses performed on sample SS-05-110909-1. The nondetect result for this compound reported for sample SS-05-110909-1 is qualified as estimated (UJ).</p> <p>Factors affecting accuracy:</p> <p>Two VOC surrogates exceeded the acceptance criteria for samples SS-03-110909-1 and SS-05-110909-1. Qualification of sample results was not required since nondetects were reported for all compounds in these samples.</p> <p>One SVOC surrogate fell outside the acceptance criteria for samples EB-110909-3 and EB-110909-3A. Qualification of the sample results was not required since only one surrogate was outside criteria.</p> <p>For VOCs, the majority of the recoveries and several RPDs fell outside the acceptance criteria for the MS/MSD analyses performed on sample SS-05-110909-1. Professional judgment was used to qualify all compounds in sample SS-05-110909-1 as estimated (J/J-/UJ).</p> <p>For SVOCs, the percent recoveries for the following compounds fell below the acceptance criteria for the MS/MSD analyses performed on</p>

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Element	Comment
	<p>sample SS-05-110909-1: 3,3-dichlorobenzidine, aniline, and 4-chloroaniline. Positive and nondetect results for these compounds in sample SS-05-110909-1 are qualified as estimated (J-/UJ). Recoveries of 0% were reported for pyridine and hexachlorocyclopentadiene. The nondetects reported for these compounds are rejected (R) and are considered unusable.</p> <p>The percent recoveries for antimony, barium, and chromium fell below the acceptance criteria for the MS and/or MSD analyses performed on sample SS-05-110909-1. Positive and nondetect results for these metals in all soil samples are qualified as estimated (J-/UJ). The percent recovery for mercury exceeded the acceptance criteria for the MS analysis performed on sample performed on sample SS-05-110909-1. Nondetects were reported for mercury in all soil samples; these results are accepted without qualification.</p>

Data Reporting

Element	Comment
Report Deliverables	The report was complete
Modification of RCPs	Not applicable.
Project-Specific QA/QC	<p>MS and/or MSD analyses were performed on sample SS-05-110909-1 for all parameters. See above for evaluation of these results.</p> <p>RPDs were acceptable for field duplicate samples SS-10-110909-1/SS-10-110909-2 analyzed for all parameters. Target analytes were not detected in the Trip Blank or equipment blank samples EB-110909-3 and EB-110909-3A.</p>
TICs	Not reported.

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Table 1 - Data Validation Summary of Qualified Data

Sample ID	Matrix	Compound	Result	QL	Units	Validation Qualifiers	Validation Reason
EB-110909-3	WQ	2,4-Dimethylphenol		5.0	ug/l	UJ	ld
EB-110909-3	WQ	4-Chloroaniline		5.0	ug/l	UJ	l
EB-110909-3	WQ	Phenol		7.0	ug/l	UJ	l
EB-110909-3	WQ	PYRIDINE		50	ug/l	UJ	ld,l
EB-110909-3	WQ	1,2,4-Trichlorobenzene		5.0	ug/l	UJ	l
EB-110909-3	WQ	ANILINE		20	ug/l	UJ	l
EB-110909-3	WQ	Hexachloroethane		5.0	ug/l	UJ	l
EB-110909-3	WQ	Hexachlorobutadiene		10	ug/l	UJ	l
EB-110909-3A	WQ	2,4-Dimethylphenol		5.0	ug/l	UJ	ld
EB-110909-3A	WQ	4-Chloroaniline		5.0	ug/l	UJ	l
EB-110909-3A	WQ	Phenol		7.0	ug/l	UJ	l
EB-110909-3A	WQ	PYRIDINE		50	ug/l	UJ	ld,l
EB-110909-3A	WQ	1,2,4-Trichlorobenzene		5.0	ug/l	UJ	l
EB-110909-3A	WQ	ANILINE		20	ug/l	UJ	l
EB-110909-3A	WQ	Hexachloroethane		5.0	ug/l	UJ	l
EB-110909-3A	WQ	Hexachlorobutadiene		10	ug/l	UJ	l
SS-01-110909-1	SO	Antimony		2.6	mg/kg	UJ	m
SS-01-110909-1	SO	Barium	34	0.52	mg/kg	J-	m
SS-01-110909-1	SO	Chromium	12	0.52	mg/kg	J-	m
SS-01-110909-1	SO	Copper	44	0.52	mg/kg	J+	l
SS-02-110909-1	SO	Antimony		2.6	mg/kg	UJ	m
SS-02-110909-1	SO	Barium	79	0.53	mg/kg	J-	m
SS-02-110909-1	SO	Chromium	17	0.53	mg/kg	J-	m
SS-02-110909-1	SO	Copper	50	0.53	mg/kg	J+	l
SS-03-110909-1	SO	Antimony		2.7	mg/kg	UJ	m
SS-03-110909-1	SO	Barium	16	0.54	mg/kg	J-	m
SS-03-110909-1	SO	Chromium	7.8	0.54	mg/kg	J-	m
SS-03-110909-1	SO	Copper	4.4	0.54	mg/kg	J+	l
SS-04-110909-1	SO	Antimony		2.5	mg/kg	UJ	m
SS-04-110909-1	SO	Barium	23	0.51	mg/kg	J-	m
SS-04-110909-1	SO	Chromium	8.3	0.51	mg/kg	J-	m
SS-04-110909-1	SO	Copper	19	0.51	mg/kg	J+	l
SS-05-110909-1	SO	Antimony		2.5	mg/kg	UJ	m
SS-05-110909-1	SO	Barium	170	0.49	mg/kg	J-	m
SS-05-110909-1	SO	Chromium	19	0.49	mg/kg	J-	m
SS-05-110909-1	SO	Copper	3.6	0.49	mg/kg	J+	l
SS-06-110909-1	SO	Antimony		2.5	mg/kg	UJ	m
SS-06-110909-1	SO	Barium	35	0.50	mg/kg	J-	m
SS-06-110909-1	SO	Chromium	12	0.50	mg/kg	J-	m
SS-06-110909-1	SO	Copper	31	0.50	mg/kg	J+	l
SS-07-110909-1	SO	Antimony		2.3	mg/kg	UJ	m
SS-07-110909-1	SO	Barium	33	0.46	mg/kg	J-	m
SS-07-110909-1	SO	Chromium	13	0.46	mg/kg	J-	m
SS-07-110909-1	SO	Copper	20	0.46	mg/kg	J+	l
SS-08-110909-1	SO	Antimony		2.4	mg/kg	UJ	m
SS-08-110909-1	SO	Barium	33	0.48	mg/kg	J-	m
SS-08-110909-1	SO	Chromium	13	0.48	mg/kg	J-	m
SS-08-110909-1	SO	Copper	12	0.48	mg/kg	J+	l
SS-09-110909-1	SO	Antimony		2.2	mg/kg	UJ	m
SS-09-110909-1	SO	Barium	34	0.44	mg/kg	J-	m

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Sample ID	Matrix	Compound	Result	QL	Units	Validation Qualifiers	Validation Reason
SS-09-110909-1	SO	Chromium	9.5	0.44	mg/kg	J-	m
SS-09-110909-1	SO	Copper	11	0.44	mg/kg	J+	l
SS-10-110909-1	SO	Antimony		2.3	mg/kg	UJ	m
SS-10-110909-1	SO	Barium	27	0.47	mg/kg	J-	m
SS-10-110909-1	SO	Chromium	12	0.47	mg/kg	J-	m
SS-10-110909-1	SO	Copper	54	0.47	mg/kg	J+	l
SS-10-110909-2	SO	Antimony		2.3	mg/kg	UJ	m
SS-10-110909-2	SO	Barium	28	0.46	mg/kg	J-	m
SS-10-110909-2	SO	Chromium	12	0.46	mg/kg	J-	m
SS-10-110909-2	SO	Copper	52	0.46	mg/kg	J+	l
SS-11-110909-1	SO	Antimony		2.4	mg/kg	UJ	m
SS-11-110909-1	SO	Barium	48	0.47	mg/kg	J-	m
SS-11-110909-1	SO	Chromium	12	0.47	mg/kg	J-	m
SS-11-110909-1	SO	Copper	18	0.47	mg/kg	J+	l
SS-12-110909-1	SO	Antimony		2.2	mg/kg	UJ	m
SS-12-110909-1	SO	Barium	21	0.44	mg/kg	J-	m
SS-12-110909-1	SO	Chromium	13	0.44	mg/kg	J-	m
SS-12-110909-1	SO	Copper	8.1	0.44	mg/kg	J+	l
SS-13-110909-1	SO	Antimony		2.4	mg/kg	UJ	m
SS-13-110909-1	SO	Barium	29	0.49	mg/kg	J-	m
SS-13-110909-1	SO	Chromium	13	0.49	mg/kg	J-	m
SS-13-110909-1	SO	Copper	44	0.49	mg/kg	J+	l
SS-14-110909-1	SO	Antimony		2.5	mg/kg	UJ	m
SS-14-110909-1	SO	Barium	130	0.50	mg/kg	J-	m
SS-14-110909-1	SO	Chromium	19	0.50	mg/kg	J-	m
SS-14-110909-1	SO	Copper	7.4	0.50	mg/kg	J+	l
SS-05-110909-1	SO	Ethylbenzene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	Styrene		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	cis-1,3-Dichloropropene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	trans-1,3-Dichloropropene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	N-PROPYLBENZENE		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	N-BUTYLBENZENE		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	4-CHLOROTOLUENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,4-Dichlorobenzene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2-Dibromoethane		4.8	ug/kg	UJ	m
SS-05-110909-1	SO	1,2-Dichloroethane		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	ACRYLONITRILE		4.8	ug/kg	UJ	m
SS-05-110909-1	SO	4-Methyl-2-pentanone		12	ug/kg	UJ	m
SS-05-110909-1	SO	1,3,5-TRIMETHYLBENZENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	BROMOBENZENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Toluene		1.8	ug/kg	UJ	m
SS-05-110909-1	SO	Chlorobenzene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	TETRAHYDROFURAN		24	ug/kg	UJ	m
SS-05-110909-1	SO	TRANS-1,4-DICHLOROBUTENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2,4-Trichlorobenzene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Dibromochloromethane		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	Tetrachloroethylene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	SEC-BUTYLBENZENE		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	P/M-XYLENE		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	1,3-DICHLOROPROPANE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	cis-1,2-Dichloroethylene		1.2	ug/kg	UJ	m

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Sample ID	Matrix	Compound	Result	QL	Units	Validation Qualifiers	Validation Reason
SS-05-110909-1	SO	trans-1,2-Dichloroethene		1.8	ug/kg	UJ	m
SS-05-110909-1	SO	Methyl tert-Butyl Ether (MTBE)		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	1,3-Dichlorobenzene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Carbon Tetrachloride		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	1,1-DICHLOROPROPENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	2-Hexanone		12	ug/kg	UJ	m
SS-05-110909-1	SO	2,2-DICHLOROPROPANE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,1,1,2-TETRACHLOROETHANE		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	Acetone	63	12	ug/kg	J	m,ld
SS-05-110909-1	SO	Chloroform		1.8	ug/kg	UJ	m
SS-05-110909-1	SO	Benzene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	1,1,1-Trichloroethane		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	Bromomethane		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	Chloromethane		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	DIBROMOMETHANE		12	ug/kg	UJ	m
SS-05-110909-1	SO	Chloroethane		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	Vinyl Chloride		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	Methylene Chloride		12	ug/kg	UJ	m
SS-05-110909-1	SO	Carbon Disulfide		60	ug/kg	UJ	m
SS-05-110909-1	SO	Bromoform		4.8	ug/kg	UJ	m
SS-05-110909-1	SO	Bromodichloromethane		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	1,1-Dichloroethane		1.8	ug/kg	UJ	m
SS-05-110909-1	SO	1,1-Dichloroethene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	Trichlorofluoromethane		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Dichlorodifluoromethane		12	ug/kg	UJ	m
SS-05-110909-1	SO	1,1,2-Trichloro-1,2,2-trifluoroethane		4.8	ug/kg	UJ	m
SS-05-110909-1	SO	1,2-Dichloropropane		4.2	ug/kg	UJ	m
SS-05-110909-1	SO	2-Butanone	90	12	ug/kg	J	m
SS-05-110909-1	SO	1,1,2-Trichloroethane		1.8	ug/kg	UJ	m
SS-05-110909-1	SO	Trichloroethene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	1,1,2,2-Tetrachloroethane		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	1,2,3-Trichlorobenzene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Hexachlorobutadiene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Naphthalene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	o-Xylene		2.4	ug/kg	UJ	m
SS-05-110909-1	SO	2-CHLOROTOLUENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2-Dichlorobenzene		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2,4-TRIMETHYLBENZENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2-Dibromo-3-chloropropane		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	1,2,3-TRICHLOROPROPANE		12	ug/kg	UJ	m
SS-05-110909-1	SO	TERT-BUTYLBENZENE		6.0	ug/kg	UJ	m
SS-05-110909-1	SO	Isopropylbenzene		1.2	ug/kg	UJ	m
SS-05-110909-1	SO	P-ISOPROPYLTOLUENE		1.2	ug/kg	UJ	m
SS-01-110909-1	SO	2,4-Dinitrophenol		1700	ug/kg	UJ	ld,l
SS-01-110909-1	SO	4,6-Dinitro-2-methylphenol		1700	ug/kg	UJ	ld
SS-01-110909-1	SO	ANILINE		860	ug/kg	UJ	l
SS-01-110909-1	SO	Hexachlorocyclo-pentadiene		860	ug/kg	UJ	l,ld
SS-02-110909-1	SO	2,4-Dinitrophenol		1800	ug/kg	UJ	ld,l

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Sample ID	Matrix	Compound	Result	QL	Units	Validation Qualifiers	Validation Reason
SS-02-110909-1	SO	4,6-Dinitro-2-methylphenol		1800	ug/kg	UJ	Id
SS-02-110909-1	SO	ANILINE		920	ug/kg	UJ	I
SS-02-110909-1	SO	Hexachlorocyclo-pentadiene		920	ug/kg	UJ	Id,I
SS-03-110909-1	SO	2,4-Dinitrophenol		1800	ug/kg	UJ	Id,I
SS-03-110909-1	SO	4,6-Dinitro-2-methylphenol		1800	ug/kg	UJ	Id
SS-03-110909-1	SO	ANILINE		930	ug/kg	UJ	I
SS-03-110909-1	SO	Hexachlorocyclo-pentadiene		930	ug/kg	UJ	Id,I
SS-04-110909-1	SO	2,4-Dinitrophenol		1700	ug/kg	UJ	Id,I
SS-04-110909-1	SO	4,6-Dinitro-2-methylphenol		1700	ug/kg	UJ	Id
SS-04-110909-1	SO	ANILINE		840	ug/kg	UJ	I
SS-04-110909-1	SO	Hexachlorocyclo-pentadiene		840	ug/kg	UJ	Id,I
SS-05-110909-1	SO	4-Chloroaniline		410	ug/kg	UJ	m
SS-05-110909-1	SO	PYRIDINE			ug/kg	R	m
SS-05-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-05-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id
SS-05-110909-1	SO	ANILINE		830	ug/kg	UJ	I,m
SS-05-110909-1	SO	Hexachlorocyclo-pentadiene			ug/kg	R	m
SS-05-110909-1	SO	3,3'-Dichlorobenzidine		830	ug/kg	UJ	m,Id
SS-06-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-06-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id
SS-06-110909-1	SO	ANILINE		810	ug/kg	UJ	I
SS-06-110909-1	SO	Hexachlorocyclo-pentadiene		810	ug/kg	UJ	Id,I
SS-07-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-07-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id
SS-07-110909-1	SO	ANILINE		800	ug/kg	UJ	I
SS-07-110909-1	SO	Hexachlorocyclo-pentadiene		800	ug/kg	UJ	Id,I
SS-08-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-08-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id
SS-08-110909-1	SO	ANILINE		820	ug/kg	UJ	I
SS-08-110909-1	SO	Hexachlorocyclo-pentadiene		820	ug/kg	UJ	Id,I
SS-09-110909-1	SO	2,4-Dinitrophenol		1500	ug/kg	UJ	Id,I
SS-09-110909-1	SO	4,6-Dinitro-2-methylphenol		1500	ug/kg	UJ	Id
SS-09-110909-1	SO	ANILINE		740	ug/kg	UJ	I
SS-09-110909-1	SO	Hexachlorocyclo-pentadiene		740	ug/kg	UJ	Id,I
SS-10-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-10-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id
SS-10-110909-1	SO	ANILINE		780	ug/kg	UJ	I
SS-10-110909-1	SO	Hexachlorocyclo-pentadiene		780	ug/kg	UJ	Id,I
SS-10-110909-2	SO	2,4-Dinitrophenol		1500	ug/kg	UJ	Id,I
SS-10-110909-2	SO	4,6-Dinitro-2-methylphenol		1500	ug/kg	UJ	Id
SS-10-110909-2	SO	ANILINE		750	ug/kg	UJ	I
SS-10-110909-2	SO	Hexachlorocyclo-pentadiene		750	ug/kg	UJ	Id,I
SS-11-110909-1	SO	2,4-Dinitrophenol		1500	ug/kg	UJ	Id,I
SS-11-110909-1	SO	4,6-Dinitro-2-methylphenol		1500	ug/kg	UJ	Id
SS-11-110909-1	SO	ANILINE		750	ug/kg	UJ	I
SS-11-110909-1	SO	Hexachlorocyclo-pentadiene		750	ug/kg	UJ	Id,I
SS-12-110909-1	SO	2,4-Dinitrophenol		1500	ug/kg	UJ	Id,I
SS-12-110909-1	SO	4,6-Dinitro-2-methylphenol		1500	ug/kg	UJ	Id
SS-12-110909-1	SO	ANILINE		730	ug/kg	UJ	I
SS-12-110909-1	SO	Hexachlorocyclo-pentadiene		730	ug/kg	UJ	Id,I
SS-13-110909-1	SO	2,4-Dinitrophenol		1600	ug/kg	UJ	Id,I
SS-13-110909-1	SO	4,6-Dinitro-2-methylphenol		1600	ug/kg	UJ	Id

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Sample ID	Matrix	Compound	Result	QL	Units	Validation Qualifiers	Validation Reason
SS-13-110909-1	SO	ANILINE		820	ug/kg	UJ	I
SS-13-110909-1	SO	Hexachlorocyclo-pentadiene		820	ug/kg	UJ	Id,I
SS-14-110909-1	SO	2,4-Dinitrophenol		1700	ug/kg	UJ	Id,I
SS-14-110909-1	SO	4,6-Dinitro-2-methylphenol		1700	ug/kg	UJ	Id
SS-14-110909-1	SO	ANILINE		850	ug/kg	UJ	I
SS-14-110909-1	SO	Hexachlorocyclo-pentadiene		850	ug/kg	UJ	Id,I

Reason Code	Explanation
bl	Laboratory blank contamination
c	Calibration issue
I	LCS recoveries
i	Internal standard areas
Id	Laboratory duplicate RPDs (matrix duplicate, MSD, LCSD)
m	Matrix spike recovery

Appendix C

2009 Surface Soil Data

Appendix C
2009 Surface Soil Data

			Site Locations											
Location ID:	Sample ID:	Sample Date:	SS-01 SS-01-110909-1 11/09/2009	SS-02 SS-02-110909-1 11/09/2009	SS-03 SS-03-110909-1 11/09/2009	SS-04 SS-04-110909-1 11/09/2009	SS-05 SS-05-110909-1 11/09/2009	SS-06 SS-06-110909-1 11/09/2009	SS-07 SS-07-110909-1 11/09/2009	SS-08 SS-08-110909-1 11/09/2009	SS-09 SS-09-110909-1 11/09/2009	SS-10 SS-10-110909-1 11/09/2009	SS-10 SS-10-110909-2 11/09/2009	SS-11 SS-11-110909-1 11/09/2009
CAS	Analyte	Units												
SW6010														
7440-36-0	Antimony	mg/kg	2.6 UJ	2.6 UJ	2.7 UJ	2.5 UJ	2.5 UJ	2.5 UJ	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.3 UJ	2.4 UJ
7440-38-2	Arsenic	mg/kg	6.2	4.9	1.2	1.9	1.3	3.4	2.8	2.1	1.5	4.7	4.6	2.2
7440-39-3	Barium	mg/kg	34 J-	79 J-	16 J-	23 J-	170 J-	35 J-	33 J-	34 J-	27 J-	28 J-	48 J-	48 J-
7440-41-7	Beryllium	mg/kg	0.87	1.0	0.30	0.58	0.73	0.72	0.65	0.69	0.61	0.72	0.72	0.82
7440-43-9	Cadmium	mg/kg	0.52 U	0.53 U	0.54 U	0.51 U	0.49 U	0.50 U	0.46 U	0.48 U	0.44 U	0.47 U	0.46 U	0.47 U
7440-47-3	Chromium	mg/kg	12 J-	17 J-	7.8 J-	8.3 J-	19 J-	12 J-	13 J-	13 J-	9.5 J-	12 J-	12 J-	12 J-
7440-50-8	Copper	mg/kg	44 J+	50 J+	4.4 J+	19 J+	3.6 J+	31 J+	20 J+	12 J+	11 J+	54 J+	52 J+	18 J+
7439-92-1	Lead	mg/kg	13	22	7.5	6.2	10	15	12	8.8	6.7	11	10	7.5
7440-02-0	Nickel	mg/kg	8.0	12	2.4	7.8	11	9.4	8.5	6.7	7.9	7.2	7.4	9.9
7782-49-2	Selenium	mg/kg	1.0 U	1.0 U	1.1 U	1.0 U	0.99 U	0.99 U	0.91 U	0.96 U	0.89 U	0.94 U	0.92 U	0.95 U
7440-22-4	Silver	mg/kg	0.52 U	0.53 U	0.54 U	0.51 U	0.49 U	0.50 U	0.46 U	0.48 U	0.44 U	0.47 U	0.46 U	0.62
7440-28-0	Thallium	mg/kg	1.0 U	2.1 U	1.1 U	1.0 U	0.99 U	0.99 U	0.91 U	0.96 U	0.89 U	0.94 U	0.92 U	0.95 U
7440-62-2	Vanadium	mg/kg	22	28	12	16	26	22	21	17	20	22	22	24
7440-66-6	Zinc	mg/kg	46	110	22	42	35	41	31	24	21	27	27	26
SW7471														
7439-97-6	Mercury	mg/kg	0.10 U	0.11 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.09 U	0.09 U	0.10 U	0.09 U
SW8260														
630-20-6	1,1,1,2-TETRACHLOROETHANE	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
71-55-6	1,1,1-Trichloroethane	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/kg	5.1 U	4.8 U	5.5 U	5.1 U	4.8 UJ	4.3 U	4.5 U	5.3 U	4.8 U	4.7 U	4.6 U	4.1 U
79-00-5	1,1,2-Trichloroethane	ug/kg	1.9 U	1.8 U	2.1 U	1.9 U	1.8 UJ	1.6 U	1.7 U	2.0 U	1.8 U	1.8 U	1.7 U	1.5 U
75-34-3	1,1-Dichloroethane	ug/kg	1.9 U	1.8 U	2.1 U	1.9 U	1.8 UJ	1.6 U	1.7 U	2.0 U	1.8 U	1.8 U	1.7 U	1.5 U
75-35-4	1,1-Dichloroethene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
563-58-6	1,1-DICHLOROPROPENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
87-61-6	1,2,3-Trichlorobenzene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
96-18-4	1,2,3-TRICHLOROPROPANE	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
120-82-1	1,2,4-Trichlorobenzene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
95-63-6	1,2,4-TRIMETHYLBENZENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
96-12-8	1,2-Dibromo-3-chloropropane	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
106-93-4	1,2-Dibromomethane	ug/kg	5.1 U	4.8 U	5.5 U	5.1 U	4.8 UJ	4.3 U	4.5 U	5.3 U	4.8 U	4.7 U	4.6 U	4.1 U
95-50-1	1,2-Dichlorobenzene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
107-06-2	1,2-Dichloroethane	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
78-87-5	1,2-Dichloropropane	ug/kg	4.5 U	4.2 U	4.8 U	4.4 U	4.2 UJ	3.8 U	4.0 U	4.6 U	4.2 U	4.1 U	4.0 U	3.6 U
108-67-8	1,3,5-TRIMETHYLBENZENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
541-73-1	1,3-Dichlorobenzene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
142-28-9	1,3-DICHLOROPROPANE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
106-46-7	1,4-Dichlorobenzene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
594-20-7	2,2-DICHLOROPROPANE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
78-93-3	2-Butanone	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
95-49-8	2-CHLOROTOLUENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
591-78-6	2-Hexanone	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
106-43-4	4-CHLOROTOLUENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
108-10-1	4-Methyl-2-pentanone	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
67-64-1	Acetone	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
107-13-1	ACRYLONITRILE	ug/kg	5.1 U	4.8 U	5.5 U	5.1 U	4.8 UJ	4.3 U	4.5 U	5.3 U	4.8 U	4.7 U	4.6 U	4.1 U
71-43-2	Benzene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
108-86-1	BROMOBENZENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
75-27-4	Bromodichloromethane	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
75-25-2	Bromoform	ug/kg	5.1 U	4.8 U	5.5 U	5.1 U	4.8 UJ	4.3 U	4.5 U	5.3 U	4.8 U	4.7 U	4.6 U	4.1 U
74-83-9	Bromomethane	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
75-15-0	Carbon Disulfide	ug/kg	64 U	61 U	69 U	63 U	60 UJ	54 U	56 U	66 U	60 U	59 U	57 U	51 U
56-23-5	Carbon Tetrachloride	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
108-90-7	Chlorobenzene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
75-00-3	Chloroethane	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
67-66-3	Chloroform	ug/kg	1.9 U	1.8 U	2.1 U	1.9 U	1.8 UJ	1.6 U	1.7 U	2.0 U	1.8 U	1.8 U	1.7 U	1.5 U
74-87-3	Chloromethane	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
156-59-2	cis-1,2-Dichloroethylene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
10061-01-5	cis-1,3-Dichloropropene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
124-48-1	Dibromochloromethane	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
74-95-3	DIBROMOMETHANE	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
75-71-8	Dichlorodifluoromethane	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
100-41-4	Ethylbenzene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
87-68-3	Hexachlorobutadiene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
98-82-8	Isopropylbenzene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
1634-04-4	Methyl tert-Butyl Ether (MTBE)	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
75-09-2	Methylene Chloride	ug/kg	13 U	12 U	14 U	13 U	12 UJ	11 U	11 U	13 U	12 U	12 U	11 U	10 U
91-20-3	Naphthalene	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
104-51-8	N-BUTYLBENZENE	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U

J = Estimated.
R = Rejected.
U = Not detected at specified detection limit.

HMW - High Molecular Weight
LMW - Low Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Appendix C
2009 Surface Soil Data

			Site Locations											
Location ID: Sample ID: Sample Date:			SS-01 SS-01-110909-1 11/09/2009	SS-02 SS-02-110909-1 11/09/2009	SS-03 SS-03-110909-1 11/09/2009	SS-04 SS-04-110909-1 11/09/2009	SS-05 SS-05-110909-1 11/09/2009	SS-06 SS-06-110909-1 11/09/2009	SS-07 SS-07-110909-1 11/09/2009	SS-08 SS-08-110909-1 11/09/2009	SS-09 SS-09-110909-1 11/09/2009	SS-10 SS-10-110909-1 11/09/2009	SS-10 SS-10-110909-2 11/09/2009	SS-11 SS-11-110909-1 11/09/2009
CAS	Analyte	Units												
103-65-1	N-PROPYLBENZENE	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
95-47-6	o-Xylene	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
136777-61-2	P/M-XYLENE	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
99-87-6	P-ISOPROPYLTOLUENE	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
135-98-8	SEC-BUTYLBENZENE	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
100-42-5	Styrene	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
98-06-6	TERT-BUTYLBENZENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
127-18-4	Tetrachloroethylene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
109-99-9	TETRAHYDROFURAN	ug/kg	26 U	24 U	27 U	25 U	24 UJ	22 U	22 U	26 U	24 U	24 U	23 U	20 U
108-88-3	Toluene	ug/kg	1.9 U	1.8 U	2.1 U	1.9 U	1.8 UJ	1.6 U	1.7 U	2.0 U	1.8 U	1.8 U	1.7 U	1.5 U
156-60-5	trans-1,2-Dichloroethene	ug/kg	1.9 U	1.8 U	2.1 U	1.9 U	1.8 UJ	1.6 U	1.7 U	2.0 U	1.8 U	1.8 U	1.7 U	1.5 U
10061-02-6	trans-1,3-Dichloropropene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
110-57-6	TRANS-1,4-DICHLOROBUTENE	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
79-01-6	Trichloroethene	ug/kg	1.3 U	1.2 U	1.4 U	1.3 U	1.2 UJ	1.1 U	1.1 U	1.3 U	1.2 U	1.2 U	1.1 U	1.0 U
75-69-4	Trichlorofluoromethane	ug/kg	6.4 U	6.1 U	6.9 U	6.3 U	6.0 UJ	5.4 U	5.6 U	6.6 U	6.0 U	5.9 U	5.7 U	5.1 U
75-01-4	Vinyl Chloride	ug/kg	2.6 U	2.4 U	2.7 U	2.5 U	2.4 UJ	2.2 U	2.2 U	2.6 U	2.4 U	2.4 U	2.3 U	2.0 U
SW8270														
95-94-3	1,2,4,5-Tetrachlorobenzene	ug/kg	1700 U	1800 U	1800 U	1700 U	1600 U	1600 U	1600 U	1600 U	1500 U	1600 U	1500 U	1500 U
120-82-1	1,2,4-Trichlorobenzene	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
108-60-1	2,2'-oxybis(1-Chloropropane)	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
95-95-4	2,4,5-Trichlorophenol	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
88-06-2	2,4,6-Trichlorophenol	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
120-83-2	2,4-Dichlorophenol	ug/kg	860 U	920 U	930 U	840 U	830 U	810 U	800 U	820 U	740 U	780 U	750 U	750 U
105-67-9	2,4-Dimethylphenol	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
51-28-5	2,4-Dinitrophenol	ug/kg	1700 UJ	1800 UJ	1800 UJ	1700 UJ	1600 UJ	1600 UJ	1600 UJ	1600 UJ	1500 UJ	1600 UJ	1500 UJ	1500 UJ
121-14-2	2,4-Dinitrotoluene	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
606-20-2	2,6-Dinitrotoluene	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
91-58-7	2-Chloronaphthalene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
95-57-8	2-Chlorophenol	ug/kg	510 U	550 U	560 U	510 U	500 U	480 U	480 U	490 U	440 U	470 U	450 U	450 U
95-48-7	2-Methylphenol	ug/kg	510 U	550 U	560 U	510 U	500 U	480 U	480 U	490 U	440 U	470 U	450 U	450 U
88-74-4	2-Nitroaniline	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
88-75-5	2-Nitrophenol	ug/kg	1700 U	1800 U	1800 U	1700 U	1600 U	1600 U	1600 U	1600 U	1500 U	1600 U	1500 U	1500 U
91-94-1	3,3'-Dichlorobenzidine	ug/kg	860 U	920 U	930 U	840 U	830 UJ	810 U	800 U	820 U	740 U	780 U	750 U	750 U
108-39-4	3-METHYLPHENOL/4-METHYLPHENOL	ug/kg	510 U	550 U	560 U	510 U	500 U	480 U	480 U	490 U	440 U	470 U	450 U	450 U
99-09-2	3-Nitroaniline	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
534-52-1	4,6-Dinitro-2-methylphenol	ug/kg	1700 UJ	1800 UJ	1800 UJ	1700 UJ	1600 UJ	1600 UJ	1600 UJ	1600 UJ	1500 UJ	1600 UJ	1500 UJ	1500 UJ
101-55-3	4-Bromophenyl-phenylether	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
59-50-7	4-Chloro-3-methylphenol	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
106-47-8	4-Chloroaniline	ug/kg	430 U	460 U	460 U	420 U	410 UJ	400 U	400 U	410 U	370 U	390 U	370 U	380 U
7005-72-3	4-Chlorophenyl-phenylether	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
100-01-6	4-Nitroaniline	ug/kg	600 U	640 U	650 U	590 U	580 U	560 U	560 U	580 U	520 U	540 U	520 U	530 U
100-02-7	4-Nitrophenol	ug/kg	860 U	920 U	930 U	840 U	830 U	810 U	800 U	820 U	740 U	780 U	750 U	750 U
62-53-3	ANILINE	ug/kg	860 UJ	920 UJ	930 UJ	840 UJ	830 UJ	810 UJ	800 UJ	820 UJ	740 UJ	780 UJ	750 UJ	750 UJ
111-91-1	bis-(2-chloroethoxy)methane	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
111-44-4	bis-(2-Chloroethyl)ether	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
117-81-7	bis-(2-Ethylhexyl)phthalate	ug/kg	860 U	920 U	930 U	840 U	830 U	810 U	800 U	820 U	740 U	780 U	750 U	750 U
85-68-7	Butylbenzylphthalate	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
86-74-8	Carbazole	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
132-64-9	Dibenzofuran	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
84-66-2	Diethylphthalate	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
131-11-3	Dimethylphthalate	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
84-74-2	Di-n-butylphthalate	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
117-84-0	Di-n-octylphthalate	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
118-74-1	Hexachlorobenzene	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
87-68-3	Hexachlorobutadiene	ug/kg	860 U	920 U	930 U	840 U	830 U	810 U	800 U	820 U	740 U	780 U	750 U	750 U
77-47-4	Hexachlorocyclo-pentadiene	ug/kg	860 UJ	920 UJ	930 UJ	840 UJ	R	810 UJ	800 UJ	820 UJ	740 UJ	780 UJ	750 UJ	750 UJ
67-72-1	Hexachloroethane	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
78-59-1	Isophorone	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
98-95-3	Nitrobenzene	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
621-64-7	N-Nitroso-di-n-propylamine	ug/kg	430 U	460 U	460 U	420 U	410 U	400 U	400 U	410 U	370 U	390 U	370 U	380 U
86-30-6	N-Nitrosodiphenylamine	ug/kg	1300 U	1400 U	1400 U	1300 U	1200 U	1200 U	1200 U	1200 U	1100 U	1200 U	1100 U	1100 U
82-68-8	PENTACHLORONITROBENZENE	ug/kg	860 U	920 U	930 U	840 U	830 U	810 U	800 U	820 U	740 U	780 U	750 U	750 U
87-86-5	Pentachlorophenol	ug/kg	69 U	74 U	74 U	68 U	130 U	130 U	130 U	64 U	60 U	120 U	120 U	60 U
108-95-2	Phenol	ug/kg	600 U	640 U	650 U	590 U	580 U	560 U	560 U	580 U	520 U	540 U	520 U	530 U
110-86-1	PYRIDINE	ug/kg	4300 U	4600 U	4600 U	4200 U	R	4000 U	4000 U	4100 U	3700 U	3900 U	3700 U	3800 U

J = Estimated.
R = Rejected.
U = Not detected at specified detection limit.

HMW - High Molecular Weight
LMW - Low Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Appendix C
2009 Surface Soil Data

2009 Surface Soil Data			Site Locations											
Location ID: Sample ID: Sample Date:			SS-01 SS-01-110909-1 11/09/2009	SS-02 SS-02-110909-1 11/09/2009	SS-03 SS-03-110909-1 11/09/2009	SS-04 SS-04-110909-1 11/09/2009	SS-05 SS-05-110909-1 11/09/2009	SS-06 SS-06-110909-1 11/09/2009	SS-07 SS-07-110909-1 11/09/2009	SS-08 SS-08-110909-1 11/09/2009	SS-09 SS-09-110909-1 11/09/2009	SS-10 SS-10-110909-1 11/09/2009	SS-10 SS-10-110909-2 11/09/2009	SS-11 SS-11-110909-1 11/09/2009
CAS	Analyte	Units												
91-57-6	2-Methylnaphthalene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
83-32-9	Acenaphthene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
208-96-8	Acenaphthylene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
120-12-7	Anthracene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
56-55-3	Benzo(a)anthracene	ug/kg	17 U	34	18 U	17 U	33 U	200	67	26	140	31 U	30 U	15 U
50-32-8	Benzo(a)pyrene	ug/kg	17 U	44	18 U	17 U	33 U	220	80	32	160	52	30 U	15 U
205-99-2	Benzo(b)fluoranthene	ug/kg	17 U	85	18 U	17 U	33 U	390	72	27	150	46	30 U	15 U
191-24-2	Benzo(g,h,i)perylene	ug/kg	17 U	38	18 U	17 U	33 U	190	34	16 U	130	31 U	30 U	15 U
207-08-9	Benzo(k)fluoranthene	ug/kg	17 U	27	18 U	17 U	33 U	150	57	19	140	31 U	30 U	15 U
218-01-9	Chrysene	ug/kg	17 U	55	18 U	17 U	33 U	270	52	16 U	160	31 U	30 U	15 U
53-70-3	Dibenzo(a,h)anthracene	ug/kg	17 U	18 U	18 U	17 U	33 U	41	32 U	16 U	41	31 U	30 U	15 U
206-44-0	Fluoranthene	ug/kg	21	98	18 U	17 U	33 U	500	100	24	300	31 U	30 U	15 U
86-73-7	Fluorene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	17 U	33	18 U	17 U	33 U	160	67	28	110	31 U	30 U	15 U
91-20-3	Naphthalene	ug/kg	17 U	18 U	18 U	17 U	33 U	32 U	32 U	16 U	15 U	31 U	30 U	15 U
85-01-8	Phenanthrene	ug/kg	17 U	31	18 U	17 U	33 U	160	32	16 U	69	31 U	30 U	15 U
129-00-0	Pyrene	ug/kg	17	77	18 U	17 U	33 U	420	85	21	260	31 U	30 U	15 U
	Total PAHs	ug/kg	191	540	198	187	363	2701	678	241	1660	377	330	165
	Total HMW PAHs	ug/kg	174	509	180	170	330	2541	646	225	1591	346	300	150
	Total LMW PAHs	ug/kg	17	31	18	17	33	160	32	16	69	31	30	15

PAH totals based on sum of these 11 PAHs - benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)fluoranthene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. If an individual PAH was detected at least once, the detection limit was used as a proxy concentration in the calculation of the PAH totals for those instances in which the chemical was reported as undetected.

J = Estimated.
R = Rejected.
U = Not detected at specified detection limit.

HMW - High Molecular Weight
LMW - Low Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Appendix C
2009 Surface Soil Data

2009 Surface Soil Data				Background Locations		
Location ID: Sample ID: Sample Date:			SS-12 SS-12-110909-1 11/09/2009	SS-13 SS-13-110909-1 11/09/2009	SS-14 SS-14-110909-1 11/09/2009	
CAS	Analyte	Units				
SW6010						
7440-36-0	Antimony	mg/kg	2.2 UJ	2.4 UJ	2.5 UJ	
7440-38-2	Arsenic	mg/kg	1.3	3.6	3.5	
7440-39-3	Barium	mg/kg	21 J-	29 J-	130 J-	
7440-41-7	Beryllium	mg/kg	0.54	0.76	0.92	
7440-43-9	Cadmium	mg/kg	0.44 U	0.49 U	0.50 U	
7440-47-3	Chromium	mg/kg	13 J-	13 J-	19 J-	
7440-50-8	Copper	mg/kg	8.1 J+	44 J+	7.4 J+	
7439-92-1	Lead	mg/kg	4.2	13	14	
7440-02-0	Nickel	mg/kg	6.7	8.4	9.9	
7782-49-2	Selenium	mg/kg	0.87 U	0.98 U	1.0 U	
7440-22-4	Silver	mg/kg	0.44 U	0.49 U	0.50 U	
7440-28-0	Thallium	mg/kg	0.87 U	0.98 U	1.0 U	
7440-62-2	Vanadium	mg/kg	22	25	42	
7440-66-6	Zinc	mg/kg	13	38	44	
SW7471						
7439-97-6	Mercury	mg/kg	0.08 U	0.10 U	0.10 U	
SW8260						
630-20-6	1,1,1,2-TETRACHLOROETHANE	ug/kg	1.1 U	1.2 U	1.4 U	
71-55-6	1,1,1-Trichloroethane	ug/kg	1.1 U	1.2 U	1.4 U	
79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	1.1 U	1.2 U	1.4 U	
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/kg	4.3 U	4.6 U	5.6 U	
79-00-5	1,1,2-Trichloroethane	ug/kg	1.6 U	1.7 U	2.1 U	
75-34-3	1,1-Dichloroethane	ug/kg	1.6 U	1.7 U	2.1 U	
75-35-4	1,1-Dichloroethene	ug/kg	1.1 U	1.2 U	1.4 U	
563-58-6	1,1-DICHLOROPROPENE	ug/kg	5.4 U	5.8 U	7.0 U	
87-61-6	1,2,3-Trichlorobenzene	ug/kg	5.4 U	5.8 U	7.0 U	
96-18-4	1,2,3-TRICHLOROPROPANE	ug/kg	11 U	12 U	14 U	
120-82-1	1,2,4-Trichlorobenzene	ug/kg	5.4 U	5.8 U	7.0 U	
95-63-6	1,2,4-TRIMETHYLBENZENE	ug/kg	5.4 U	5.8 U	7.0 U	
96-12-8	1,2-Dibromo-3-chloropropane	ug/kg	5.4 U	5.8 U	7.0 U	
106-93-4	1,2-Dibromoethane	ug/kg	4.3 U	4.6 U	5.6 U	
95-50-1	1,2-Dichlorobenzene	ug/kg	5.4 U	5.8 U	7.0 U	
107-06-2	1,2-Dichloroethane	ug/kg	1.1 U	1.2 U	1.4 U	
78-87-5	1,2-Dichloropropane	ug/kg	3.8 U	4.0 U	4.9 U	
108-67-8	1,3,5-TRIMETHYLBENZENE	ug/kg	5.4 U	5.8 U	7.0 U	
541-73-1	1,3-Dichlorobenzene	ug/kg	5.4 U	5.8 U	7.0 U	
142-28-9	1,3-DICHLOROPROPANE	ug/kg	5.4 U	5.8 U	7.0 U	
106-46-7	1,4-Dichlorobenzene	ug/kg	5.4 U	5.8 U	7.0 U	
594-20-7	2,2-DICHLOROPROPANE	ug/kg	5.4 U	5.8 U	7.0 U	
78-93-3	2-Butanone	ug/kg	11 U	12 U	14 U	
95-49-8	2-CHLOROTOLUENE	ug/kg	5.4 U	5.8 U	7.0 U	
591-78-6	2-Hexanone	ug/kg	11 U	12 U	14 U	
106-43-4	4-CHLOROTOLUENE	ug/kg	5.4 U	5.8 U	7.0 U	
108-10-1	4-Methyl-2-pentanone	ug/kg	11 U	12 U	14 U	
67-64-1	Acetone	ug/kg	11 U	12 U	14 U	
107-13-1	ACRYLONITRILE	ug/kg	4.3 U	4.6 U	5.6 U	
71-43-2	Benzene	ug/kg	1.1 U	1.2 U	1.4 U	
108-86-1	BROMOBENZENE	ug/kg	5.4 U	5.8 U	7.0 U	
75-27-4	Bromodichloromethane	ug/kg	1.1 U	1.2 U	1.4 U	
75-25-2	Bromoform	ug/kg	4.3 U	4.6 U	5.6 U	
74-83-9	Bromomethane	ug/kg	2.1 U	2.3 U	2.8 U	
75-15-0	Carbon Disulfide	ug/kg	54 U	58 U	70 U	
56-23-5	Carbon Tetrachloride	ug/kg	1.1 U	1.2 U	1.4 U	
108-90-7	Chlorobenzene	ug/kg	1.1 U	1.2 U	1.4 U	
75-00-3	Chloroethane	ug/kg	2.1 U	2.3 U	2.8 U	
67-66-3	Chloroform	ug/kg	1.6 U	1.7 U	2.1 U	
74-87-3	Chloromethane	ug/kg	5.4 U	5.8 U	7.0 U	
156-59-2	cis-1,2-Dichloroethylene	ug/kg	1.1 U	1.2 U	1.4 U	
10061-01-5	cis-1,3-Dichloropropene	ug/kg	1.1 U	1.2 U	1.4 U	
124-48-1	Dibromochloromethane	ug/kg	1.1 U	1.2 U	1.4 U	
74-95-3	DIBROMOMETHANE	ug/kg	11 U	12 U	14 U	
75-71-8	Dichlorodifluoromethane	ug/kg	11 U	12 U	14 U	
100-41-4	Ethylbenzene	ug/kg	1.1 U	1.2 U	1.4 U	
87-68-3	Hexachlorobutadiene	ug/kg	5.4 U	5.8 U	7.0 U	
98-82-8	Isopropylbenzene	ug/kg	1.1 U	1.2 U	1.4 U	
1634-04-4	Methyl tert-Butyl Ether (MTBE)	ug/kg	2.1 U	2.3 U	2.8 U	
75-09-2	Methylene Chloride	ug/kg	11 U	12 U	14 U	
91-20-3	Naphthalene	ug/kg	5.4 U	5.8 U	7.0 U	
104-51-8	N-BUTYLBENZENE	ug/kg	1.1 U	1.2 U	1.4 U	

J = Estimated.
R = Rejected.
U = Not detected at specified detection limit.

HMW - High Molecular Weight
LMW - Low Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Appendix C
2009 Surface Soil Data

Location ID: Sample ID: Sample Date:			Background Locations		
			SS-12 SS-12-110909-1 11/09/2009	SS-13 SS-13-110909-1 11/09/2009	SS-14 SS-14-110909-1 11/09/2009
CAS	Analyte	Units			
103-65-1	N-PROPYLBENZENE	ug/kg	1.1 U	1.2 U	1.4 U
95-47-6	o-Xylene	ug/kg	2.1 U	2.3 U	2.8 U
136777-61-2	P/M-XYLENE	ug/kg	2.1 U	2.3 U	2.8 U
99-87-6	P-ISOPROPYLTOLUENE	ug/kg	1.1 U	1.2 U	1.4 U
135-98-8	SEC-BUTYLBENZENE	ug/kg	1.1 U	1.2 U	1.4 U
100-42-5	Styrene	ug/kg	2.1 U	2.3 U	2.8 U
98-06-6	TERT-BUTYLBENZENE	ug/kg	5.4 U	5.8 U	7.0 U
127-18-4	Tetrachloroethylene	ug/kg	1.1 U	1.2 U	1.4 U
109-99-9	TETRAHYDROFURAN	ug/kg	21 U	23 U	28 U
108-88-3	Toluene	ug/kg	1.6 U	1.7 U	2.1 U
156-60-5	trans-1,2-Dichloroethene	ug/kg	1.6 U	1.7 U	2.1 U
10061-02-6	trans-1,3-Dichloropropene	ug/kg	1.1 U	1.2 U	1.4 U
110-57-6	TRANS-1,4-DICHLOROBUTENE	ug/kg	5.4 U	5.8 U	7.0 U
79-01-6	Trichloroethene	ug/kg	1.1 U	1.2 U	1.4 U
75-69-4	Trichlorofluoromethane	ug/kg	5.4 U	5.8 U	7.0 U
75-01-4	Vinyl Chloride	ug/kg	2.1 U	2.3 U	2.8 U
SW8270					
95-94-3	1,2,4,5-Tetrachlorobenzene	ug/kg	1500 U	1600 U	1700 U
120-82-1	1,2,4-Trichlorobenzene	ug/kg	370 U	410 U	430 U
108-60-1	2,2'-oxybis(1-Chloropropane)	ug/kg	370 U	410 U	430 U
95-95-4	2,4,5-Trichlorophenol	ug/kg	370 U	410 U	430 U
88-06-2	2,4,6-Trichlorophenol	ug/kg	370 U	410 U	430 U
120-83-2	2,4-Dichlorophenol	ug/kg	730 U	820 U	850 U
105-67-9	2,4-Dimethylphenol	ug/kg	370 U	410 U	430 U
51-28-5	2,4-Dinitrophenol	ug/kg	1500 UJ	1600 UJ	1700 UJ
121-14-2	2,4-Dinitrotoluene	ug/kg	370 U	410 U	430 U
606-20-2	2,6-Dinitrotoluene	ug/kg	370 U	410 U	430 U
91-58-7	2-Chloronaphthalene	ug/kg	15 U	16 U	17 U
95-57-8	2-Chlorophenol	ug/kg	440 U	490 U	510 U
95-48-7	2-Methylphenol	ug/kg	440 U	490 U	510 U
88-74-4	2-Nitroaniline	ug/kg	370 U	410 U	430 U
88-75-5	2-Nitrophenol	ug/kg	1500 U	1600 U	1700 U
91-94-1	3,3'-Dichlorobenzidine	ug/kg	730 U	820 U	850 U
108-39-4	3-METHYLPHENOL/4-METHYLPHENOL	ug/kg	440 U	490 U	510 U
99-09-2	3-Nitroaniline	ug/kg	370 U	410 U	430 U
534-52-1	4,6-Dinitro-2-methylphenol	ug/kg	1500 UJ	1600 UJ	1700 UJ
101-55-3	4-Bromophenyl-phenylether	ug/kg	370 U	410 U	430 U
59-50-7	4-Chloro-3-methylphenol	ug/kg	370 U	410 U	430 U
106-47-8	4-Chloroaniline	ug/kg	370 U	410 U	430 U
7005-72-3	4-Chlorophenyl-phenylether	ug/kg	370 U	410 U	430 U
100-01-6	4-Nitroaniline	ug/kg	510 U	570 U	600 U
100-02-7	4-Nitrophenol	ug/kg	730 U	820 U	850 U
62-53-3	ANILINE	ug/kg	730 UJ	820 UJ	850 UJ
111-91-1	bis-(2-chloroethoxy)methane	ug/kg	370 U	410 U	430 U
111-44-4	bis-(2-Chloroethyl)ether	ug/kg	370 U	410 U	430 U
117-81-7	bis-(2-Ethylhexyl)phthalate	ug/kg	730 U	820 U	850 U
85-68-7	Butylbenzylphthalate	ug/kg	370 U	410 U	430 U
86-74-8	Carbazole	ug/kg	370 U	410 U	430 U
132-64-9	Dibenzofuran	ug/kg	370 U	410 U	430 U
84-66-2	Diethylphthalate	ug/kg	370 U	410 U	430 U
131-11-3	Dimethylphthalate	ug/kg	370 U	410 U	430 U
84-74-2	Di-n-butylphthalate	ug/kg	370 U	410 U	430 U
117-84-0	Di-n-octylphthalate	ug/kg	370 U	410 U	430 U
118-74-1	Hexachlorobenzene	ug/kg	370 U	410 U	430 U
87-68-3	Hexachlorobutadiene	ug/kg	730 U	820 U	850 U
77-47-4	Hexachlorocyclo-pentadiene	ug/kg	730 UJ	820 UJ	850 UJ
67-72-1	Hexachloroethane	ug/kg	370 U	410 U	430 U
78-59-1	Isophorone	ug/kg	370 U	410 U	430 U
98-95-3	Nitrobenzene	ug/kg	370 U	410 U	430 U
621-64-7	N-Nitroso-di-n-propylamine	ug/kg	370 U	410 U	430 U
86-30-6	N-Nitrosodiphenylamine	ug/kg	1100 U	1200 U	1300 U
82-68-8	PENTACHLORONITROBENZENE	ug/kg	730 U	820 U	850 U
87-86-5	Pentachlorophenol	ug/kg	60 U	64 U	64 U
108-95-2	Phenol	ug/kg	510 U	570 U	600 U
110-86-1	PYRIDINE	ug/kg	3700 U	4100 U	4300 U

J = Estimated.

R = Rejected.

U = Not detected at specified detection limit.

HMW - High Molecular Weight
LMW - Low Molecular Weight
PAH - Polycyclic Aromatic Hydrocarbon

Appendix C
2009 Surface Soil Data

			Background Locations		
			SS-12 SS-12-110909-1 11/09/2009	SS-13 SS-13-110909-1 11/09/2009	SS-14 SS-14-110909-1 11/09/2009
CAS	Analyte	Units			
91-57-6	2-Methylnaphthalene	ug/kg	15 U	16 U	17 U
83-32-9	Acenaphthene	ug/kg	15 U	16 U	17 U
208-96-8	Acenaphthylene	ug/kg	15 U	16 U	17 U
120-12-7	Anthracene	ug/kg	15 U	16 U	17 U
56-55-3	Benzo(a)anthracene	ug/kg	15 U	26	35
50-32-8	Benzo(a)pyrene	ug/kg	15 U	33	42
205-99-2	Benzo(b)fluoranthene	ug/kg	15 U	32	39
191-24-2	Benzo(g,h,i)perylene	ug/kg	15 U	16 U	19
207-08-9	Benzo(k)fluoranthene	ug/kg	15 U	21	30
218-01-9	Chrysene	ug/kg	15 U	16	27
53-70-3	Dibenzo(a,h)anthracene	ug/kg	15 U	16 U	17 U
206-44-0	Fluoranthene	ug/kg	15 U	27	54
86-73-7	Fluorene	ug/kg	15 U	16 U	17 U
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	15 U	31	36
91-20-3	Naphthalene	ug/kg	15 U	16 U	17 U
85-01-8	Phenanthrene	ug/kg	15 U	16 U	19
129-00-0	Pyrene	ug/kg	15 U	24	44
	Total PAHs	ug/kg	150	242	345
	Total HMW PAHs	ug/kg	135	226	326
	Total LMW PAHs	ug/kg	15	16	19

PAH totals based on sum of these 11 PAHs - benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)fluoranthene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. If an individual PAH was detected at least once, the detection limit was used as a proxy concentration in the calculation of the PAH totals for those instances in which the chemical was reported as undetected.

Appendix D

Historic Groundwater Data

Appendix D
Historic Groundwater Data

Analyte	Well ID	GZ-1	GZ-2	GZ-3	GZ-3	GZ-3	GZ-3	GZ-3	GZ-3	GZ-4	GZ-5	GZ-6	GZ-6
	Contractor	GZA	GZA	GZA	GZA	ENSR	ENSR	ENSR	ENSR	GZA	GZA	GZA	GZA
	Units	10/28/1999	10/28/1999	10/28/1999	12/16/1999	4/18/2001	7/18/2001	10/17/2001	2/7/2002	10/28/1999	10/28/1999	10/28/1999	12/16/1999
VOCs													
Acetone	ug/L	1 U	1 U	1 U	1 U	500 U	20 U	20 U	20 U	1 U	1 U	1 U	1 U
2-Butanone (MEK)	ug/L	1 U	1 U	1 U	1 U	250 U	10 U	10 U	10 U	1 U	1 U	1 U	1 U
Chloroethane	ug/L	5 U	5 U	5 U	5 U	10 U	5.2	2 U	2.2	5 U	5 U	5 U	5 U
1,1-Dichloroethane	ug/L	1 U	1 U	190	290	180	320	1 U	140	1 U	1 U	1 U	1 U
1,1-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	ug/L	1 U	1 U	21	36	18	34	1 U	9	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	ug/L	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/L	1 U	1 U	2000	1300	100	1700	1 U	4	1 U	1 U	1 U	1 U
Ethylbenzene	ug/L	1 U	1 U	230	260	190	320	1 U	15	1 U	1 U	1 U	1 U
Total Xylenes	ug/L	1 U	1 U	580	700	217	880	2 U	2 U	1 U	1 U	1 U	1 U
Isopropylbenzene	ug/L	1 U	1 U	1.1	2	5 U	2	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	ug/L	1 U	1 U	1.7	1	5 U	1	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	ug/L	1 U	1 U	2	3	5 U	2	1 U	1 U	1 U	1 U	1 U	1 U
4-Isopropyltoluene	ug/L	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	ug/L	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	ug/L	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	ug/L	10 U	10 U	10 U	16	10 U	2 U	1 U	2 U	10 U	10 U	10 U	10 U
Trichlorofluoromethane	ug/L	25 U	25 U	20	25 U	5 U	1 U	1 U	1 U	25 U	25 U	25 U	25 U
Metals													
Barium	mg/L	0.05 U	0.05 U	0.056	0.056	0.054	0.043	0.0258	0.040	0.058	0.0500 U	0.0500 U	0.0500 U
Cadmium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.0013 U	0.0013 U	0.0036	0.0013 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
Chrom.	mg/L	0.05 U	0.05 U	0.05 U	0.050 U	0.0025 U	0.0025 U	0.0025 U	0.0033	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Copper	mg/L	NS	NS	NS	0.050 U	0.0054	0.0025 U	0.0029	0.0025 U	NS	NS	NS	0.0500 U
Lead	mg/L	0.013 U	0.013 U	0.014	0.013 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0130 U	0.0130 U	0.0130 U	0.0130 U
Nickel	mg/L	NS	NS	NS	0.050 U	0.0025 U	0.0025 U	0.0040	0.0025 U	NS	NS	NS	0.0500 U
Zinc	mg/L	NS	NS	NS	0.010 U	0.0083	0.0025 U	0.0104	0.0127	NS	NS	NS	0.0100 U

NS = Not Sampled.

U = Not detected at specified detection limit.

Data previously evaluated in ENSR. 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

Appendix D
Historic Groundwater Data

Analyte	Well ID	GZ-7	GZ-7	GZ-7	GZ-7	GZ-7	GZ-7	GZ-8	GZ-9	GZ-9	GZ-9	GZ-9	GZ-9
	Contractor	GZA	GZA	ENSR	ENSR	ENSR	ENSR	GZA	GZA	ENSR	ENSR	ENSR	ENSR
	Units	10/28/1999	12/16/1999	4/18/2001	7/18/2001	10/17/2001	2/7/2002	12/16/1999	12/16/1999	4/18/2001	7/18/2001	10/17/2001	2/7/2002
VOCs													
Acetone	ug/L	1 U	1 U	100 U	20 U	20 U	20 U	1 U	1 U	100 U	20 U	20 U	20 U
2-Butanone (MEK)	ug/L	1 U	1 U	50 U	10 U	10 U	10 U	1 U	1 U	50 U	10 U	10 U	10 U
Chloroethane	ug/L	5 U	5 U	2 U	2 U	2 U	2 U	5 U	5 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/L	1 U	1 U	1 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	1 U	1 U
Ethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Xylenes	ug/L	1 U	1 U	2 U	2 U	2 U	2 U	1 U	1.3	2 U	2 U	2 U	2 U
Isopropylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Isopropyltoluene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	3.1	1 U	1 U	1 U	1 U
Chloroform	ug/L	400	200	1 U	26	110	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	ug/L	1.2	1.1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	ug/L	10 U	10 U	1 U	2 U	1 U	2 U	10 U	10 U	1 U	2 U	1 U	2 U
Trichlorofluoromethane	ug/L	25 U	25 U	1 U	1 U	1 U	1 U	25 U	25 U	1 U	1 U	1 U	1 U
Metals													
Barium	mg/L	0.0500 U	0.17	0.068	0.16	0.017	0.091	0.050 U	0.058	0.0347	0.0200 U	0.27	0.019
Cadmium	mg/L	0.0050 U	0.0050 U	0.0013 U	0.0013 U	0.0013 U	0.0135	0.0050 U	0.0050 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Chrom.	mg/L	0.0500 U	0.0500 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0500 U	0.0500 U	0.0025 U	0.0025 U	0.0035	0.0025 U
Copper	mg/L	NS	0.0500 U	0.0045	0.0025 U	0.0048	0.0025 U	0.0500 U	0.0500 U	0.0045	0.0025 U	0.0075	0.0025 U
Lead	mg/L	0.0130 U	0.0130 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0130 U	0.0130 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U
Nickel	mg/L	NS	0.0500 U	0.0025 U	0.0025 U	0.0026	0.0025 U	0.0500 U	0.0500 U	0.0025 U	0.0025 U	0.0031	0.0025 U
Zinc	mg/L	NS	0.0100 U	0.0078	0.0056	0.0153	0.0142	0.0100 U	0.0100 U	0.0075	0.0039	0.0088	0.0035

NS = Not Sampled.

U = Not detected at specified detection limit.

Data previously evaluated in ENSR. 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

Appendix D
Historic Groundwater Data

Analyte	Well ID	GZ-10	GZ-10	GZ-10	GZ-10	GZ-10	GZ-11	GZ-11	GZ-11	GZ-11	MW-1	MW-1	MW-1	MW-1
	Contractor	GZA	ENSR	ENSR	ENSR	ENSR	GZA	ENSR	ENSR	ENSR	ENSR	ENSR	ENSR	ENSR
	Units	12/16/1999	4/18/2001	7/18/2001	10/17/2001	2/7/2002	12/16/1999	4/18/2001	7/18/2001	2/7/2002	4/18/2001	7/18/2001	10/17/2001	2/7/2002
VOCs														
Acetone	ug/L	1 U	100 U	20 U	20 U	25	1 U	100 U	20 U	20 U	100 U	20 U	20 U	20 U
2-Butanone (MEK)	ug/L	1 U	50 U	10 U	10 U	22	1 U	50 U	10 U	10 U	50 U	10 U	10 U	10 U
Chloroethane	ug/L	5 U	2 U	2 U	2 U	2 U	5 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	ug/L	6.6	1 U	1.3	1 U	2.5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	ug/L	2.1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	ug/L	4.9	1 U	1 U	1 U	1.3	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/L	1 U	1 U	2 U	1 U	1 U	1 U	1 U	5	1 U	1 U	1.8	1 U	1 U
Ethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Xylenes	ug/L	1 U	2 U	2 U	2 U	2 U	1 U	2 U	2	2 U	2 U	2 U	2 U	2 U
Isopropylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Isopropyltoluene	ug/L	5.7	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	ug/L	10 U	1 U	2 U	1 U	2 U	10 U	1 U	2 U	2 U	2 U	2 U	1 U	2 U
Trichlorofluoromethane	ug/L	25 U	1 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Metals														
Barium	mg/L	0.11	0.075	0.085	0.047	0.68	0.050 U	0.071	0.01 U	0.27	0.17	0.094	0.073	0.041
Cadmium	mg/L	0.024	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0054 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Chrom.	mg/L	0.0500 U	0.0025 U	0.0025 U	0.0047	0.0025 U	0.0500 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Copper	mg/L	0.0500 U	0.0045 U	0.0025 U	0.0138	0.0025 U	0.0500 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Lead	mg/L	0.0130 U	0.0038 U	0.0038 U	0.01	0.0038 U	0.0130 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U
Nickel	mg/L	0.0500 U	0.0025 U	0.0025 U	0.0048	0.0075	0.0500 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0040	0.0025 U
Zinc	mg/L	0.0100	0.0049	0.00878	0.0246	0.0155	0.0100 U	0.0084	0.0056	0.0035	0.0047	0.0025 U	0.0097	0.0053

NS = Not Sampled.

U = Not detected at specified detection limit.

Data previously evaluated in ENSR. 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

Appendix D
Historic Groundwater Data

Analyte	Well ID	MW-2	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3
	Contractor	ENSR	ENSR	ENSR	ENSR	ENSR	ENSR	ENSR	ENSR
Analyte	Units	4/18/2001	7/18/2001	10/17/2001	2/7/2002	4/18/2001	7/18/2001	10/17/2001	2/7/2002
VOCs									
Acetone	ug/L	100 U	20 U	20 U	20 U	100 U	20 U	20 U	39
2-Butanone (MEK)	ug/L	50 U	10 U	10 U	10 U	50 U	10 U	10 U	10 U
Chloroethane	ug/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-Dichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	4.2
Ethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Xylenes	ug/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Isopropylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Isopropyltoluene	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	170	1 U
Bromodichloromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	ug/L	2 U	2 U	1 U	2 U	2 U	2 U	1 U	2 U
Trichlorofluoromethane	ug/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Metals									
Barium	mg/L	0.12	0.066	0.18	0.062	0.02	0.086	0.077	0.26
Cadmium	mg/L	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Chrom.	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0048	0.0048	0.0025 U
Copper	mg/L	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0057	0.0025 U	0.0037	0.0025 U
Lead	mg/L	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U
Nickel	mg/L	0.0025	0.0025 U	0.0026	0.0029	0.0025 U	0.0037	0.0037	0.0025 U
Zinc	mg/L	0.0054	0.0039	0.0114	0.0125	0.0075	0.0046	0.0089	0.0323

NS = Not Sampled.

U = Not detected at specified detection limit.

Data previously evaluated in ENSR. 2004. Verification Report. Arch Chemicals, Inc., 350 Knotter Drive, Cheshire, Connecticut. March 2004.

Appendix E

Refinement of Soil COPCs

The results of the Screening-level Ecological Risk Assessment (SLERA) indicated that the potential for adverse impacts to terrestrial receptors from exposure to two constituents of potential concern (COPCs; chromium and vanadium) could not be eliminated based comparison of surface soil data to conservative ecological soil screening values. It is important to recognize that exceedance of a screening value does not imply that remediation is (or is not) required; only that additional ecological risk characterization activities should be considered in order refine the risk evaluation.

As discussed in U.S. EPA technical guidance (U.S. EPA, 2001), as well as in earlier U.S. EPA (1997) guidance for Superfund ecological risk assessment, COPCs may be refined in the first step of the Baseline Ecological Risk Assessment (BERA) to help streamline the overall ecological risk assessment process. Factors such as consistency with background concentrations, frequency and magnitude of detection, and dietary considerations may all be used to help refine the COPC list. The refinement of soil COPCs presented in this appendix is based on an evaluation of Site COPC concentrations relative to background concentrations.

Three surface soil (0-2 ft) samples were collected from background locations on the Arch property on November 9, 2009. Samples were analyzed for the same suite of constituents as in the Site samples - metals, VOCs, and SVOCs (including polycyclic aromatic hydrocarbons (PAHs)). Individual sample results for all constituents are presented in Appendix C. Locations are presented on Figure 6 of the main report and are described below:

- SS-12 – Background sample collected from location in wooded area to the west of the facility buildings. This sampling location was moved from the proposed sampling location within the wetlands at southern end of property due to a lack of access. CTDEP and U.S. EPA personnel agreed to the re-location of this sample during the November 2009 sampling event.
- SS-13 – Background sample collected within the open lawn area to the west of facility buildings mid-way between the building and Knotter Drive.
- SS-14 – Background sample collected at northern end of property. Sample was collected closer to stream channel than property boundary to avoid influence of parking lot runoff from adjacent property.

Table 1 of this appendix presents the analytical results for the two soil COPCs in the 11 Site samples and three background samples. The maximum Site concentrations were 19 mg/kg for chromium and 28 mg/kg for vanadium. Concentrations of chromium ranged from 13 to 19 mg/kg in background samples. Concentrations of vanadium ranged from 22 to 42 mg/kg in background samples. All Site concentrations were within the range of the background concentrations indicating that conditions on-Site are consistent with background.

The results presented in this appendix indicate that no further ERA evaluation of chromium or vanadium in soil is warranted at the Site.

Appendix E Table 1
Sample-by-Sample Evaluation of
Surface Soil COPCs Compared to Background Concentrations

COPCs	Background Locations			Site Locations										
	SS-12	SS-13	SS-14	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09	SS-10 [b]	SS-11
Metals (mg/kg)														
Chromium	13 J-	13 J-	19 J-	12 J-	17 J-	7.8 J-	8.3 J-	19 J-	12 J-	13 J-	13 J-	9.5 J-	12 J-	12 J-
Vanadium	22	25	42	22	28	12	16	26	22	21	17	20	22	24

J = Estimated value, biased low.

mg/kg = milligrams per kilogram, equivalent to parts per million (ppm).

NV = No value identified.

U = Not detected at specified detection limit.

ug/kg= micrograms per kilogram, equivalent to parts per billion (ppb).

VOCs = Volatile organic compounds, analyzed by EPA Method 8260.